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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

MALCOLM RIGBY, Editor

Vol. 11 September 1960 No. 9

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Special Feature in This Issue

Annotated Bibliography on Rocket Meteorology
By
Elemer Kiss

(For table of contents see back cover)

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FOREWORD

Meteorological and Geoastrophysical Abstracts is a monthly publication whose purpose is to bring to the attention of meteorologists, geophysicists and astrophysicists current literature in their field.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a special subject. Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
5. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
9. Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

1. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
5. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm
9. Condensation Trails	10. Clim. of N. E. Africa	11. Mountain Met.	Detect.

Vol. III, 1952

1. Clim. of N. W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
5. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
9. Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

1. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc.
5. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
9. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V. 1954

1. Oceanog. Met.	2. Clim. of S. E. Asia	3. Auroral Physics	4. Tropopause
5. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
9. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Vol. VI, 1955

1. Bibliog. of Bibliog.	2. Texts & Monogr. Bibliogs.	3. Storm Surges
4. Ionospheric Prop.	5. Photochem.—Upper Atmos.	6. Cloud Physics
7. Radar Cloud Physics	8–9. Atmos. Nuclei	10. Weather Modification 11. Cooling Power

Vol. VII, 1956

1. Synoptic Met.-Arctic	2. Clim. of Enclosed Spaces	3. Cosmic Rays (–1952)
4. Cosmic Rays (1953–56)	5. Atmos. Radioactivity	6. Inversions
7. Snow Micromet.	8. Snow Micromet. (Suppl.)	9–11. Tropical Cyclones

Vol. VIII, 1957

1. Solar Weather Relations	2. Night Airglow	3. Forecasting Special Elements
4. Forest Micrometeorology	5. Hydromet. Forecasting	6. Numerical Forecast. (Suppl.)
7. Albedo 8. Meteors	9–10. Tropospheric Prop.	11. Medical Meteorology

Vol. IX, 1958

1. Radioastronomy	2. Solar Astrophysics	3. Radioactivity in Atmosphere
4. Waves and Currents	5. Physical Oceanog.	6. Dynamic & Phys. Oceanog.
7. Long Range Forecast.	8. Radar Met. 9. Cosmic Rays	10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks	2. Tornado Forecasting	3. Soil Moisture	4. Sferics
5–6. Ozone	7. Acoustic Waves	8. Evaporation Measurement	
9. Evapotranspiration (–1955)	10. Evapotranspiration (1956–1959)	11. Evaporation	

Vol. XI, 1960

1. Outstanding Reference Works	2. Outstanding Texts	3. Numerical Forecast. (Suppl.)
4. Ionospheric Physics	5. Ionospheric Propagation	6. Ionosphere
7. Forecast Verification	8. Radar Meteorology	9. Rocket Meteorology

Other bibliographies in preparation are:

Airglow	*High Atmosphere Temperatures*	*Satellite Meteorology*
Aurora	*Precipitation Chemistry*	*Twilight Phenomena*

Part III contains a listing of reviews, translations, reprints, and the contents of important publications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. The December issue comprises cumulative author, subject, geographical and journal indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DSI:	Smithsonian Institution, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts.
Ⓢ	after an abstract indicates an abstract prepared for NASA.

Geographic locations are in the English form rather than the form used locally, for example, Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet using a modification of the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau, Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL AND GEOASTROPHYSICAL MATERIAL

A. GENERAL

1. COLLECTED WORKS

See also: **Ionosphere, 11.9–18.**

11.9–1 523.03(02) 523.7(02)

***†Handbuch der Physik, Band 51, Astrophysik II, Sternaufbau.** [Handbook of Physics, Vol. 51, Astrophysics, Vol. 2, Stellar structure.] Berlin, Springer-Verlag, **1958.** 830 p. 197 figs., tables, refs., eqs. **DLC** (QC21.H327)—Continuing the excellent and detailed compilation of data and information on astrophysics, this volume covers stellar interiors, stellar evolution, frequency of elements in planets and meteorites, in sun and stars, variable stars, stellar stability, magnetic fields of stars, novae, supernovae, etc. Each article, by a different author, is full of theory, data, diagrams, references, and charts. Detailed overall subject indexes are appended in French, German—English and English-German. Articles are in English, French and German. *Subject Headings:* **1. Handbook of astrophysics 2. Astrophysics handbooks.**—*M.R.*

11.9–2 629.19(08)

†Advances in Space Science, Vol. 1, 1959. Ed. by Frederick I. Ordway, III, Wernher von Braun, Frederick C. Durant, III, Eugen Sänger et al. N. Y., Academic Press, **1959.** 412 p. figs., tables, bibliogs., eqs. Articles of interest (abstracted separately): Huth, John H., **Power supplies for orbital and space vehicles,** p. 111–157; Schaefer, Hermann J., **Radiation and man in space,** p. 267–339. **DWB** (629.1388 A244), **DLC** (TL787.A3). Review by Alex E. Green in *Science,* 131(3417):1880, June 24, **1960.**—A collection of articles especially compiled for scientists and engineers working in the many related fields of astronautics. A chapter is devoted to the subject of orbits and interplanetary trajectories; another consists of a review of knowledge and a critical evaluation of interplanetary communications; still another chapter treats the problem of supplying power on board orbital and space vehicles. Three other chapters consider in order manned space cabin systems, the effects of radiation on man in space, and the nutritional aspects of space flight. *Subject Heading:* **1. Astronautics. I. Ordway, Frederick I., III** (*ed.*).—*I.S.* ®

11.9–3 629.19(08)

†Seifert, Howard S. (*ed.*), **Space technology.** By L. M. K. Boetler, H. G. Stever et al. N. Y., John Wiley, **1959.** 33 ch. and appendix, each separately paged. figs., tables, bibliogs., eqs. Four of the articles (abstracted separately) are of special interest to aeronomists: Eggers, Alfred J., Jr., **Possibility of a safe landing** (Ch. 13). Haber, Heinz, **The physical factors of the space environment** (Ch. 27). Kaplan, Joseph and Barth, Charles A., **IGY research in the upper atmosphere** (Ch. 31). Van Allen, James A., **Scientific uses of space vehicles: satellite experiments** (Ch. 32). **DWB** (621.1388 S459sp)—A collection of articles on astronomy, aerodynamics, electronics, chemistry, mechanics and biology written by 38 experts in these and other fields, presented to several thousand students and laymen at the beginning of the Space Age. The five main sections (after an introductory section) are: II. Flight dynamics (terrestrial, satellite, lunar, interplanetary flight, trajectories and re-entry problems); III. Propulsion and structures, including magnetohydrodynamics; IV. Communications, guidance and control; V. Man in space (physical, medical, cabin design, equipment and crew performance); and VI. Applications of space technology (IGY, handling future needs, possibility and limitations). The whole work is profusely illustrated with modern photographs, charts, diagrams and other material to supplement the text and theory, and each chapter has a good bibliography appended. *Subject Heading:* **1. Astronautics.**—*M.R.* ®

11.9–4 551.521(08) 551.510.535(08)

Symposium on Scientific Effects of Artificially Introduced Radiations at High Altitudes, National Academy of Sciences, April 29, 1959, **Papers.** *IGY, 1957/1958. IGY World Data Center A [for] Rockets and Satellites, IGY Satellite Report Series*, No. 9, Sept. 15, **1959.** p. 1141–1228. Reprinted from *National Academy of Sciences, Proceedings*, 45(8), Aug. 15, **1959.** These papers also appeared in *Journal of Geophysical Research*, 64(8):865–938, Aug. **1959.** (For listing of papers in the *Journal, see* Pt. III, p. 1612, Oct. 1959, *Met Abstracts*; all papers abstracted separately from the *Journal.*) **DWB** (629.1388 I612 sa)—Significant advances have been made in controlled auroral and upper atmosphere studies by the introduction of new instruments, such as the riometer and improved concepts and fundamentals associated with the Argus experiments. A general survey of such experiments and the results achieved through various investigations are presented in six papers. They cover a description of the characteristics of Argus shells, the theory of geomagnetically trapped electrons from an artificial source and the lifetime and distribution of such electrons. The last two papers in the collection describe the optical, electromagnetic and satellite observations that have been made. They also discuss visual observations of auroras in the magnetic conjugate areas as well as radar observations of auroral ionization. On the whole, these investigations have led to the possibility of generating auroras of limited extent and hydromagnetic waves. *Subject Headings:* **1. High altitude radiation symposia 2. Upper atmosphere research.**—*N.N.* Ⓢ

2. TEXTBOOKS—TECHNICAL BOOKS—HANDBOOKS

See also: **Aeronaut. met. texts** (Parczewski), 11.9–37; **Fire weather observers handbooks,** 11.9–51; **Offshore oil deposits** (Emery), 11.9–57.

11.9–5 523.5(02)

*†Astapovich, Igor Stanislavovich, **Meteornye iavleniia v atmosfere Zemli.** [Meteoric phenomena in the earth's atmosphere.] Moscow, Gosudarstvennoe Izdatel'stvo Fiziko-Mathematicheskoĭ Literatury, **1958.** 640 p. 285 figs., 14 tables, 1004 refs., 174 eqs. **DWB** (523.5 A852me)—A thorough text with ample theory, data, graphs, illustrations, etc. on all phases of meteors and their observation by visual, photographic and radar techniques, starting with 2 chapters giving a historical account of meteor research, followed by 33 chapters covering, among other things, the earth's atmosphere in relation to meteors, meteors as means of sounding the atmosphere, eye observations, visibility, types of meteors, visual observation methods, photographic methods, radio methods, frequency of meteors, radiants, height, speed, orbits, brightness, spectra, temperature, dimensions, form, ablation, theory, mass, ionization, gaseous trails, electromagnetic phenomena, bolides, trajectories of meteorite fall, acoustics of bolides and meteorites, meteoroseismic phenomena, telescopic meteors, cosmic dust of meteoric origin in the atmosphere and meteoric matter at the surface. *Subject Headings:* **1. Meteor textbooks 2. Bolides 3. Meteor acoustics.**—*M.R.*

11.9–6 551.590.21(02)

†Ellison, Mervyn A. (*Prof. Astronomy, Dublin Inst. for Advanced Studies*), **The sun and its influence: an introduction to the study of solar-terrestrial relations.** 2d ed. rev. London, Routledge and Kegan Paul, **1959.** 237 p. figs., tables, foot-refs., bibliog. p. 227–232. (For abstract on first ed., 1955, *see* 8.7–6, July 1957, *Met. Abstracts.*) **DWB** (523.7 E47s). Review by C. W. Allen in *Nature*, London, 186(4718):69, April 2, **1960.**—The first (1955) edition of this small book has been slightly revised and updated to include preliminary material on the subject of solar-terrestrial relations emanating from the IGY. The subjects treated in a readable manner are: solar radiation, solar activity, solar atmosphere, ionosphere, solar flares and their effects on the earth's atmosphere, effects on geomagnetism, the aurora, radio waves from the sun, and, finally, cosmic rays. Appended are tables or theory for finding mass of the sun, radiation laws and sun temperature, Zurich sunspot numbers for 200 yrs, radio flux from sun and radio propagation in ionosphere and corona. Extensive references arranged by chapters are also appended. *Subject Headings:* **1. Solar-terrestrial relationship textbooks 2. Ionosphere 3. Auroras 4. Geomagnetism 5. Solar radio radiation.**—*M.R.* Ⓢ

11.9–7 551.1(02)

*†Jeffreys, Sir Harold, **The earth: its origin, history and physical constitution.** 4th ed. Cambridge, University Press, **1959.** 420 p. 10 plates, 30 figs., numerous tables and eqs., bibliog. p. 402–420. Price: 75 sh. **DLC** (QE501.J4 1959). 1st edition, **1924.** 3rd ed., **1952.** Review by B. Gutenberg in *Nature*, London, 184(4692): 1007–1008, Oct. 3, **1959.** Review by K. E. Bullen in *Australian Journal of Science*, Sydney, 22(7):305–306, Jan. **1960.**—Many changes have been made in theories as to the origin and physics of the earth and planets since the first edition of this classic was published in 1924. Hence in the 3rd (1952) and 4th editions it was necessary to omit several chapters on cosmogony (4 chapters on the origin of the solar system) which were found in the first and second editions and to add much new material on seismology, the age of the earth, its thermal history, tidal friction, continental drift hypothesis, lunar surface, polar wandering, convection currents, creep microseisms, etc., especially in the form of better quantitative data on which to base or reject hypotheses. Far more is known of radioactivity, and dating is more precise (and established dates older than formerly). Chapters cover: 1) mechanical properties of rocks, 2) theory of elastic waves, 3) observational seismology, 4) the theory of the figures of the earth and moon, 5) observational figures of earth and moon, 6) stress differences in the earth, 7) variation of latitude and bodily tide, 8) tidal friction, 9) age of earth, 10) thermal history of earth, 11) origin of surface features of earth and 12) special problems. Appendices give critical tables on stress differences, cooling of a sphere, long-period tides, etc. A voluminous bibliography, valid throughout, is included along with good author and subject indexes. *Subject Heading:* **1. Origin of earth.**—*M. R.* ⑤

11.9–8 523.03(02)

†Kopal, Zdeněk (*Univ. Manchester*), **Close binary systems.** London, Chapman and Hall; New York, John Wiley and Sons, **1959.** 558 p. numerous figs., tables, eqs., bibliog. at end of each ch. Price: 105 sh. (*International Astrophysics Series*, Vol. 5.) **DLC** (QB821.K75 1959). Review by A. R. Hogg in *Australian Journal of Science*, Sydney, 22(7):302, Jan. **1960.**—A textbook covering in detail the theory and present knowledge of close binary systems, dynamics, the Roche model, theoretical light changes, theoretical velocity changes, determination of elements of eclipsing binary systems and, finally, physical properties of close binary systems (double stars). Double stars have been known for centuries but many are not physically (merely optically) pairs. Thousands of real binaries are now mapped. Author and subject indexes are appended. *Subject Headings:* **1. Astrophysics textbooks 2. Binary systems.**—*M. R.* ⑤

11.9–9 518.3(02)

Leven, Alexander Sander (*Univ. Calif., Berkeley*), **Nomography.** 2d ed. N. Y., John Wiley; London, Chapman and Hall Ltd., **1959.** 296 p. numerous figs. (2 fold. in back), 4 tables, numerous eqs. Price: $8.50. (1st edition, **1948.**) **DLC** (QA90.L45)—A sizeable textbook dealing with the application of nomographic methods to testing experimental data in fields such as statistics, electronics, ballistics, heat transfer, radioactivity, medicine, engineering, physical science, business, etc. The geometric method has been used in developing the basic theory for design of the numerous types of alignment charts with 3 or more variables as covered in the first 11 chapters. Ch. 12 covers design of net charts; Ch. 13, circular nomograms; Ch. 14, use of determinants; Ch. 15, projective transformations and Ch. 16, the relation between concurrency and alignment nomograms with applications to experimental data. All manner of graphical data presentations are described and illustrated and numerous numerical examples given. *Subject Heading:* **1. Nomogram design textbooks.**—*M. R.*

11.9–10 523(02)

Mehlin, Theodore Grefe, **Astronomy.** New York, John Wiley, **1959.** 392 p. numerous figs. Price: $7.95. **DLC** (QB45.M4)—An elementary textbook on astronomy written for college students with a basic understanding of science and mathematics, but with no advanced theory. The most recent equipment (even the first 6 artificial satellites) is described and illustrated and the latest concepts of cosmology are promulgated. The sun, galaxies, our galaxy, the solar system, planets, earth, earth's satellites, comets and meteors and origin of the

solar system each constitute the subject of chapters which are well illustrated and accompanied by questions for students. The treatment is not superficial from the point of view of astronomy as a whole, though it might seem so to the specialist in any given field. *Subject Headings:* **1. Astronomy textbooks 2. Satellite observatories.**—*M.R.* ⑤

11.9–11 551.506.7:551.507.321.2(02)

*†Mikhel', Vasiliĭ Mikhaĭlovich, **Voprosy metodiki sharopiltonykh nabliudeniĭ, ikh obrabotka i prakticheskoe primenenie.** [Problems of methodology for pilot balloon observations, their processing and practical use.] Leningrad, Gidrometeoizdat., **1959.** 226 p. 21 figs. (1 fold.), 12 charts (2 fold.), bibliog. p. 199–206, 134 eqs. **DWB** (M01.7 M636vo)—A comprehensive work on theory and practice of accurately measuring upper air winds and cloud heights by single station pilot balloon observations. The angular diameter of the balloon gives one check on the real height as compared with the assumption of constant rate of ascent. These methods have been tested since 1928 at Pavlovsk, the Main Geophysical Observatory, etc. Magnitude of errors detected this way is shown in tables. Other methods treated include the tail method, comparison with heights of radiosonde balloons, isobaric surfaces, etc. A major part of the book is devoted to applications of accurate wind data to various types of meteorological problems (aeroclimatology, forecasting upper air winds, shear, precipitation, cloud physics, drought and dry winds.) *Subject Headings:* **1. Pilot balloon observation textbooks 2. Pilot balloon errors 3. Upper air wind applications.**—*M.R.*

11.9–12 551.508.71(02)

†Usol'tsev, Vladimir Aleksandrovich, **Izmerenie vlazhnosti vozdukha (metody i pribory).** [Measurement of atmospheric humidity: methods and instruments.] Leningrad, Gidromet. izdat., **1959.** 181 p. 29 figs., 16 tables, 108 refs., numerous eqs. **DWB** (M08.7 U86iz)—A systematic text reviewing in Pt. I the 16 different methods of measuring humidity in the air: 1) absorption, 2) condensation, 3) evaporation, 4) psychrometer, 5) salt psychrometer, 6) compensation psychrometer, 7) exchange, 8) thermo-electrolitic, 9) sorption, 10) diffusion, 11) dew point, 12) adiabatic dewpoint, 13) compressional dewpoint, 14) thermal conductivity, 15) infrared absorption and 16) dielectric permeability. Pt. II takes up the tele-psychrometer; Pt. III, the thermo-electric hygrometer; Pt. IV, the diffusion hygrometer; Pt. V, the dew point hygrometer and Pt. VI, calibration methods. A good bibliography and auxiliary tables for computation of humidity are appended. *Subject Headings:* **1. Hygrometry textbooks 2. Hygrometers 3. Humidity measurement techniques.**—*M.R.*

11.9–13 52(023)

†Bok, Bart Jan, **The astronomer's universe.** Melbourne, Melbourne Univ. Press; London and N. Y., Cambridge Univ. Press, **1958.** 107 p. 7 figs., 16 plates, bibliog. p. 97–100. Price: $3.75. **DLC** (QB51.B75). Review by Allan Sandage in *Science*, Wash., D. C., 130(3377):700–701, Sept. 18, **1959.**—A nicely illustrated, popular book on the solar system, stars, galaxies and cosmogony with emphasis on modern discoveries. Several pages are devoted to planetary atmospheres and radio astronomy and a section of the sun gives a nontechnical account of present knowledge of solar physics. *Subject Heading:* **1. Astronomy.**—*M.R.*

3. MONOGRAPHS AND MAJOR REVIEW ARTICLES

See also: **Astrophysics handbook,** 11.9–1.

11.9–14 551.508.25:551.521.18

*†Lecomte, Jean, **Spectroscopie dans l'infrarouge.** [Spectroscopy in the infrared.] *Handbuch der Physik*, Berlin, 26:244–937, **1958.** 555 figs., tables, 85 refs.+numerous foot-refs., numerous eqs. **DLC** (QC21.H327)—The fourth article in Vol. 26 of the *Handbuch der Physik* (the 2d volume on **Light and Matter**) comprises the major part of the volume (nearly 700 out of 950 pages), and consists of over 50 chapters arranged under 8 general headings: A. Introduction, B. Methods of infrared spectrometry, C. Spectra of infrared absorption or reflection in general, D. Infrared absorption spectra of organic compounds, E. Inorganic components (water vapor spectra, p. 671–684), F. Application to analysis of mixtures, G. Absolute intensity

of infrared bands or rays and H. Dispersion in the infrared. As usual the treatise is full of data, graphs, references, spectra, etc. *Subject Headings:* **1. Infrared spectroscopy 2. Water vapor spectrum.**—*M.R.*

11.9–15 535.37

*†Garlick, G. F. J., **Luminescence.** *Handbuch der Physik*, Vol. 26: 1–128, **1958.** 135 figs., 11 tables, 15 refs., foot-refs., numerous eqs. Price: DM 168.00; $40.00. **DLC** (QC21.H327). Review by L. Marton, in *Physics Today*, N. Y., 12(5):46–47, May **1959.**—The first article in this Vol. 26 (the 2d volume on **Light and Matter**) of the *Handbuch der Physik*, contains a consolidated review of current knowledge and data on all aspects of luminescence and associated phenomena: theory, nature, classes of phosphors, physical processes involved in solely electrical properties (electro-photoluminescence), cathode and radio luminescence, experimental techniques, etc. Numerous complex graphs, tables of data and references are included. *Subject Headings:* **1. Luminescence 2. Phosphorescence.**—*M.R.* Ⓢ

11.9–16 551.589(47)

§*†Bliumina, L. I., **Analiz povtoriaemosti nekotorykh sinopticheskikh protsessov.** [Analysis of the frequency of certain synoptic processes.] Leningrad, Gidrometeoizdat., **1954.** 104 p. 23 figs., 22 tables, 14 refs. **DLC** (QC871.B55)—Data for 14 years (1938–1951) are used to study the recurrence of ultrapolar synoptic processes and their natural synoptic periods characterized by isolated low-level cyclones in winter and in summer, respectively. The history of the study of these processes is reviewed, methods outlined, a catalogue of situations given and illustrated by charts, graphs and tables and synoptic examples presented and discussed. Many frequency diagrams and tables are included and forecast rules presented. *Subject Headings:* **1. Ultrapolar synoptic processes 2. Synoptic climatology of U.S.S.R. 3. U.S.S.R.**—*M.R.*

11.9–17 523.34:778.3 629.19

Akademiia Nauk SSSR, **Pervye fotografii obratnoĭ storony luny.** [First photographs of the far side of the moon.] Moscow, Akademiia Nauk SSSR, **1959.** 33 p. 8 figs., (incl. photos), table. Bound with this in DWB copy: Transl. into English, including figs. (but not photos), issued as *U. S. Office of Technical Services, Information on Soviet Bloc International Geophysical Cooperation*, 1959. (issue for) Dec. **1959.** 26 p. **DWB** (523.39 A313pe). English transl. issued by Pergamon Press, N. Y., **1960,** with title **The other side of the moon,** transl. by J. B. Sykes. 36 p. 8 figs., etc. **DWB** (523.A313ot) —An elegant publication issued in remarkably short time after the successful photography (relayed by TV) of the lunar backside on Oct. 4, 1959 showing photos obtained in close proximity to the moon by Soviet Automatic Interplanetary Station. The details of construction, orientation, transmission and navigation, (orbits) etc. of the satellite and features of the invisible side of the moon are described in the text and nicely illustrated. *Subject Headings:* **1. Moon's backside photographs 2. Soviet lunar satellite—Oct. 4, 1959 3. Lunar satellites 4. Automatic interplanetary stations.**—*M.R.* Ⓢ

4. IGY—ARCTIC—ANTARCTIC

See also: **IGY radiation program,** 11.9–4; **IGY obs., Sulphur Mt.** (Korff), 11.9–31; **IGY solar program,** 11.9–74; **IGY auroral program** (Hatherton, Midwinter), 11.9–126; **IGY geomag. program** (Matsushita), 11.9–137; **Heat balance of ice** (Iakovlev), 11.9–265; **Pressure effects on ice** (Rodewald), 11.9–280; **Wind stress on ice** (Sverdrup), 11.9–296.

11.9–18 551.590.21:551.510.535

Institute of Radio Engineers, **Nature of the ionosphere: an IGY objective.** Special issue of its *Proceedings*, Vol. 47, No. 2, Feb. **1959.** p. 131–327. Pref. by Millett G. Morgan. (For listing of papers of the Special Issue, *see* Pt. III, p. 625, April 1960, *Met. Abstracts*. These papers abstracted separately.) **DLC**—The issue opens with a quest editorial by L. V. Berkner. The first papers describe the undisturbed ionosphere, and the succeeding ones, the severe disturbances which are produced by solar flares. Following these are papers describing

rocket and satellite measurements in both the undisturbed and the disturbed ionosphere. As an addendum, papers have been included describing some of the special purpose radio equipment used in making ionospheric measurements, and the global system of warning and communication developed for the IGY. *Subject Headings:* **1. Ionosphere 2. Solar flare effects on ionosphere 3. Satellite ionosphere measurement.**—*Author's abstract.* Ⓢ

11.9–19 551.506.22(99)

International Geophysical Year, 1957/1958. Comité National Français. Sous-Comité Antarctique Français, **Rapport d'activité des Expéditions Antarctiques Françaises,** 1957–1959. [Report of activities of the French Antarctic Expeditions, 1957–1959.] Paris, June **1959.** 114 p. figs. **DWB** (919.9 E96rap)—A thorough report on the activities at the French Antarctic IGY stations (Dumont D'Urville Base and Charcot Station) during 1958 in the fields of ionosphere, geomagnetism, meteorology, atmospheric optics, zone, glaciology, oceanography, seismology, thermal balance, gravimetry and in various aspects of the work such as photo lab., hygiene, engineering, energy, radio communication, cooking, aerial support, etc. The first 2 stations were established in 1956; location with respect to Little America, MacMurdo and other stations in that sector is shown on map. Mean data for climatic elements are given in tables. *Subject Headings:* **1. French participation in IGY 2. Antarctic IGY operations 3. Dumont D'Urville Base, Antarctica 4. Charcot Station, Antarctica.**—*M. R.* Ⓢ

11.9–20 551.594.5 551.521.326 551.506.22

*†Krasovskiĭ, V. I. (*ed.*), **Spektral'nye elektrofotometricheskie i radiolokatsionnye issledovaniia poliarnykh siianiĭ i svecheniia nochnogo neba.** [Spectral, electrophotometric and radar research on aurorae and night airglow.] Moscow, Akademiia Nauk SSSR, **1959.** (The seven articles abstracted separately.) **DWB** (M94.5 K89sp). Transl. into English by John Miller, issued by American Meteorological Society under Contract AF 19(604)-1936, as its T-RC-14+, July **1959.** 65 p. figs., tables, refs. At head of English translation: Academy of Sciences of the USSR, Interdepartmental Committee of the International Geophysical Year.—This is the first in a series of systematic publications based on data obtained from Loparskaia, Roshchino and Zvenigorod, the three stations of the Atmospheric Physics Institute of Academy of Sciences of the U.S.S.R. and on the data collected at observatories and observation points in the Arctic according to the IGY program. *Subject Headings:* **1. Auroral research 2. Night airglow research 3. IGY program. I. Miller, J.** (*transl.*).—*I.S.* Ⓢ

11.9–21 551.506.22

Morrison, Charles C., **International Geophysical Year.** *Geographical Review,* N. Y., 49(4):580–582, Oct. **1959. DWB, DLC**—This is a brief summary of the scope and accomplishments of the IGY (1957–1958) during which some 20,000–30,000 technical personnel from 66 nations and a comparable number of volunteers occupied more than 4000 primary stations and several thousand temporary stations. The committees continuing the IGY effort are listed. A spectacular aurora on Feb. 10–11, 1958 was preceded by intense solar flares 28 hours earlier. Auroral X-rays greatly increased in intensity during the storm and certain cosmic ray phenomena decreased. This provided additional support for the theory that the earth moves into the path of large solar gas clouds, which are responsible for terrestrial manifestations of solar activity. The Van Allen radiation belt is populated with charged particles that are trapped in the earth's magnetic field and are recharged occasionally by these solar plasmas. Measurement of ultraviolet and X-ray emissions from the sun during an eclipse showed that X-rays may originate in the corona while U-V rays emanate from the disk. In the Pacific a man-made aurora was observed immediately after an atomic explosion. In Antarctica a new twilight phenomenon in the form of a line at a wave length of approximately 6000 A may be related to the presence of lithium in the upper air. Partial confirmation of an earlier hypothesis that the land beneath the Antarctic ice is an archipelago may have been confirmed partially by seismic exploration of a trough between the Ross Sea and the Weddell Sea. Records dating from 1912 at Little America indicate that the climate has warmed about 5°F. Mass wasting of Antarctic ice is evident at the Lady Newness Ice Shelf. Deep drilling at Little America was carried to a depth of 1050 ft, nearly to sea level, in 1959. The temperature at the bottom of the hole was 25°F whereas it was −29°C at the bottom of 1013 ft hole at the

Byrd Station in the preceding field season. The Antarctic atmosphere is on the average 20°F colder than the Arctic in winter; the Arctic circulation is more unstable. On Dec. 6, 1958, the earth satellite Pioneer III went aloft and provided additional data on the Van Allen radiation belt, etc. *Subject Headings:* **1. International Geophysical Year, 1957–1958 2. IGY Antarctic program.**—*I.L.D.*

11.9–22 91.04(235.1) 551.506.22:551.58:551.32

*Moscow. Universitet. Geograficheskiĭ Fakul'tet, **Informatsionnyĭ sbornik o rabotakh Geograficheskogo fakul'teta Moskovskogo gosudarstvennogo universiteta po Mezhdunarodnomu geofizicheskomu godu.** [Compilation of information on the activities of the Geographical Faculty of the Moscow University on the IGY], No. 1, pub. Moscow, **1958.** 298 p. figs. and tables (some fold.). Mimeo. At head of cover-title: Mezhdunarodnyĭ Geofizicheskiĭ God, 1957/1958, Année Géophysique Internationale. **DWB.** Transl. by David Kraus of table of contents into English issued by American Meteorological Society under contract AF 19(604)-1936, Dec. **1958.** 2 p.—Includes a series of reports on glaciological and winter climate studies carried out by expeditions of Moscow State University on Elbrus Mt. in the Caucasus (6 reports) and Khibiny Mts. on the Kola Peninsula (5 reports) during IGY, in 1957. It also contains preliminary information on meteorological (including aerological, actinometric and cloud photography) observations, activities of Pamirs expedition, and seismic soundings of Antarctic glacier cover in 1955–1957. Some general problems on glaciology, permafrost, and snow properties are taken up in the last 5 reports. The reports are amply provided with graphs, figures and tables. *Subject Headings:* **1. Soviet participation in IGY 2. Climatology 3. Glaciology 4. Caucasus Mts., U.S.S.R. 5. Kola Peninsula, U.S.S.R. I. Tushinskiĭ, G. K.** (*ed.*) **II. International Geophysical Year, 1957/1958. Soviet participation.**—*A.M.P.*

11.9–23 551.506.7:551.521.64:551.507.321

*†Winckler, J. R. (*Univ. Minnesota*), **Balloon study of high-altitude radiations during the International Geophysical Year.** *Journal of Geophysical Research*, Wash., D. C., 65(5):1331–1359, May **1960.** 19 figs., 5 tables, 36 refs., 13 eqs. **DLC**—The results of a series of 85 constant level balloon flights conducted during the IGY period to measure cosmic rays and other types of radiation at high altitude are summarized. Each flight carried an ionization chamber, a Geiger counter, and nuclear emulsions, and remained at approximately 10 g/cm² depth for times between 2 and 24 hrs. The majority of flights were made at Minneapolis, Minn. The large decrease in primary cosmic-ray intensity between 1956 and 1958 was observed at high altitude. The high altitude measurements correlate with sea level neutron instruments. Many special events were detected, including X-rays produced by electrons incident on the atmosphere during strong aurorae and solar cosmic rays detected on ten occasions and correlating with other known observations made in the polar regions. In one case γ rays originating on the solar surface were detected in a short burst. Several cases of radioactive layers in the atmosphere at low level resulting from nuclear explosions were found. This paper summarizes the entire program, and gives the instrumental details, a summary of published information, and detailed analysis of many data not heretofore published. *Subject Headings:* **1. Balloon investigation of upper atmosphere radiation 2. Cosmic ray measurement techniques 3. IGY radiation program.**—*Author's abstract.* Ⓢ

5. SERVICES—INSTITUTIONS

See also: **Hydrologic service, Ukraine** (Aksenov), 11.9–183; **U. S. W. B. hurricane warning service** (Sik, Sadowski), 11.9–258.

11.9–24 551.5:061.1(410)

Great Britain. Meteorological Office, **Your weather service.** 3rd ed. London, H. M. Stationery Office, **1959.** 56 p. Photos, figs., charts, tables. (*See* 7.2–28, Feb. 1956, *Met. Abstracts*, for 2d rev. ed., **1955.**) **DLC** (QC995.G67)—A revised version of a pamphlet first issued in 1950, describing and vividly illustrating the services and activities of the British Meteorological Office. The first section describes observations, analysis and forecast centers and activities; Sec. II. public and personal services; III. interpretation of forecasts; IV. use of

processing of weather and climatic records for agriculture, industry, marine and other activities or planning and the M.O. Library. Appended are details on the following aspects: 1. forecasts and reports supplied to the press; 2. telephone and telegraph reports and forecasts; 3. personal forecasts; 4. Daily Weather Report; 5. definitions of forecast terminology; 6. climatic averages etc. for London. *Subject Headings:* **1. British Meteorological Service 2. United Kingdom** —*M.R.*

11.9–25 551.5:061.1.1(496.5)(09

Kasneci, Petro (*Tirana*), **Az albán hidrometeorologiai szolgálat tíz éve.** [Ten years of the Albanian Hydrometeorological Service.] *Időjárás*, Budapest, 63(1):53–55, Jan./Feb. **1959**

DLC—The first meteorological observations in Albania were made at Durres in 1868 (discontinued in 1878). At Skodr observations have been made since 1888 (with a gap from 1919 to 1940). In 1940 the Italian occupation force established a network of 50 airport stations which was, however, destroyed at the end of the war. A synoptic network was established in 1947 and a Hydrometeorological Directorate in 1949. At the end of 1958 there were over 180 meteorological and 60 hydrological stations. The Albanian network is now uniform in instrumentation and methods of observation. The Soviet Union has supplied most of the equipment and much of the training. 24-hour and 3-day forecasts are being issued by a Central Synoptic Station. These forecasts are disseminated by radio and press. Special forecasts are also issued to various institutions. An aerological station has been in operation since 1957. *Subject Headings:* **1. Meteorological services 2. History of meteorology 3. Albania.**—*G.T.*

11.9–26 551.5:061(477)(09

Prikhot'ko, G. F., **100 let Ukrainskogo nauchno-issledovatel'skogo gidrometeorologicheskogo instituta (Geofizicheskoĭ observatorii).** [100th anniversary of the Ukrainian Hydrometeorological Research Institute (Geophysical Observatory).] *Kiev, Ukraine Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 5:5–14, **1956.** 5 photos

DWB, DLC—A historical outline of the gradual development of the Meteorological Observatory organized in 1855 at the University of Kiev into the present day Ukrainian Hydrometeorological Research Institute with a survey of the scientific activities of its subsequent directors, among whom were such outstanding Russian meteorologists as Brounov and Sreznevskiĭ, is presented. *Subject Headings:* **1. Ukrainian Hydrometeorological Service 8. History of meteorology 3. Kiev, Ukrainian S.S.R.**—*A.M.P.*

11.9–27 551.58:061.6(44

Urbain, Pierre (*France*), **L'organisation et le programme des centres de recherches climatologiques en France.** [The organization and program of climatological research centers in France.] *International Journal of Bioclimatology and Biometeorology*, Leiden, Netherlands Vol. 2 (Pt. 7), **1958.** 3 p. **DWB**—A Center of Climatological Research should consist of sections of medical climatology, bioclimatology and physical climatology. The bioclimatology and physical climatology sections are to provide medical climatology with a more complete definition of local and regional climate than has been made hitherto. These sections are therefore, of fundamental importance since they provide the basis upon which the medical climatologist can operate. In contrast to the experimental work of the biological and physical sections, the medical section should begin with statistical studies of morbidity at a station and should determine the existence of correlations between climate and disease. Other problems of investigation involve adaptation to local or regional climates by the healthy, ill or convalescent subject. In order to secure critical evaluations of results obtained at one station, the establishment of a union of centers of Climatological Research is recommended. Such a union was decided upon in France in 1957. Also the national and international unions should cooperate and exchange information. *Subject Headings:* **1. Climatological research 2. France** —*I.L.D.*

11.9–28 551.521.11:551.593:378.9(47

V Komissii po fizike atmosfery pri Akademii Nauk SSSR. [The Commission on Atmospheric Physics of the Academy of Sciences of the U.S.S.R.] *Meteorologiia i Gidrologiia*

Leningrad, No. 11:69, 1958. **DWB, DLC**—A subcommittee on actinometry and atmospheric optics has been formed in the Commission of Atmospheric Physics of the Academy of Sciences of the U.S.S.R. The chairman is K. Ia. Kondrat'ev. The members of the Commission are listed. Its task is primarily to coordinate research on radiation and to make available the results. *Subject Headings:* **1. Radiation research 2. Atmospheric optics 3. U.S.S.R.**—*I.L.D.*

11.9–29 551.506:632.11:368.54

Ovchinnikov, M. N. **Ispol'zovanie materialov gidrometeorologicheskoĭ sluzhby organami Gosstrakha SSSR.** [Utilization of the data of the Hydrometeorological Service by units of the State Insurance Bureau of the U.S.S.R.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:40–41, April 1958. **DWB, DLC**—The State Insurance Bureau of the U.S.S.R. insures crops throughout the country against damage or destruction by weather, such as hail, frost, flood, etc. The observations of meteorological and agrometeorological stations published in the various bulletins are the initial material for indicating the areas of distress. Analysis of the material on crop damage and destruction shows that most of the units of the Hydrometeorological Service provide in their bulletins adequate information on the degree of damage to agricultural crops and they also provide special information on weather and crop conditions. Even merely formal statements on the temperature, humidity, wind, etc., which are the only weather data provided by some stations, are useful in the assessment and payment of insurance. The significance of information of growth ratios of reported data on minimums, air and soil temperatures, etc. are discussed. *Subject Headings:* **1. Meteorological data 2. Insurance meteorology 3. Crop insurance 4. U.S.S.R.**—*I.L.D.*

11.9–30 551.501.9(798,71)

U. S. Bureau of Aeronautics (Navy), **The Arctic weather station.** Project AROWA (TED-UNL-MA-501.16), [Unnumbered report], Sept. 1957. 66 p. 8 figs., chart, map, table. **DWB** (M01.9 U583ar)—The Naval Research Laboratory has made several meteorological investigations and forecasting studies in Alaska and other western Arctic areas in order to understand the effects such weather changes in those areas have on U. S. and Canadian weather. This report is mainly on the instrumentation, equipment and maintenance of available instruments at Alaskan and Canadian stations. *Subject Headings:* **1. Arctic weather stations 2. Alaska 3. Canada. I. Project AROWA (TED-UNL-MA-501.16).**—*N.N.*

11.9–31 551.501.9:551.43

Korff, Serge A., **Canadian high-altitude station at Sulphur Mountain.** *Physics Today*, New York, 11(2):24–25, Feb. 1958. 3 photos. **DWB**—The Special Committee for the International Geophysical Year (CSAGI) recommended in Rome in 1954 the establishment of a strategic observatory in the Canadian Rockies for the studying of auroras and ionospheric physics. The station is located on the top of Sulphur Mt., directly adjacent to the town of Banff, Alberta (geog. coordinates are 51.1°N, 115.6°W; geomag. latitude of 58°N). Banff is at an elevation of 4500 ft and the laboratory at 7500 ft. The station houses a neutron monitor. *Subject Headings:* **1. High altitude observatories 2. Sulphur Mt., Alberta, Canada.**—*N.N.*

6. CONFERENCES—SYMPOSIA

See also: **High altitude radiation symposia,** 11.9–4; **Medical met. symposia** (Jungmann), 11.9–52; **Hurricane conf.,** 11.9–254; **Actinometric and heat balance conf.** (Portnov), 11.9–271; **Hydrologic conf.** (Popova), 11.9–318; **Conf. on cargo holds meteorology** (Bullig), 11.9–327.

11.9–32 551.5:550.3:681.14:621.38:061.3

Royal Astronomical Society, **The automatic reduction of geophysical data (Jan. 23, 1959).** *Geophysical Journal*, London, 2(3):250–255, Sept. 1959. 4 eqs. **DWB, DLC**—A discussion was held in the rooms of the Royal Astronomical Society on Jan. 23, 1959. The chairman, Sir Edward Bullard, began the discussion by answering the possible question of why one would wish for the automatic reduction of data, by saying that this was because of the size

of the problem undertaken and the heavy burden of reducing some data by desk calculations. It gave greater accuracy and saved time for the scientist. Several speakers took part in the discussion that followed. R. H. MESSON of the Royal Aircraft Establishment spoke on the reduction of interferometer and time theodolite observations of earth satellites. The second speaker was G. A. CORBY of the Meteorological Office, who discussed numerical weather forecasting with the aid of computers. H. P. BOTT of Durham University spoke next about his use of a digital computer to reduce and interpret data about the gravitational field obtained by regional surveys over geological formations. O. C. MARTIN, from the Royal Society, outlined the problems of data processing arising from the International Geophysical Year. The fifth speaker was M. J. TUCKER of the National Institute of Oceanography. His remarks referred to measuring and analyzing the spectrum of random Gaussian processes. The possible use of a digital computer for ionospheric forecasting was the topic of a communication by C. M. MINNIS of the Radio Research Station. A. T. DENNISON, British Petroleum Company spoke about the use of digital computers in exploration in geophysics. G. W. LENNON of the Liverpool Observatory spoke on the processing of earth tide data. H. M. LYER of India, the last speaker, spoke on analysis of microseisms. *Subject Headings:* **1. Geophysical data reduction 2. Data processing.**—*I.S.*

11.9–33 551.509.33:061.3

Schaefer, Vincent J., **The second Adirondack Conference on Meteorology.** *American Meteorological Society, Bulletin*, 39(12):657–658, Dec. **1958. DWB, DLC**—The Munitalp Foundation and the High Altitude Observatory of the University of Colorado sponsored the second Adirondack Conference on Meteorology. The conference was held at Dercum's Ski Tip Lodge near Arapahoe Basin in the Colorado Rockies, Sept. 24–27, 1958. Long range forecast methods, principles and research programs were discussed in detail. *Subject Headings:* **1. Meteorological conferences.**—*N.N.*

7. EDUCATION—HISTORY—BIOGRAPHY—BIBLIOGRAPHY

EDUCATION

See: **Training courses in met., 11.9–40.**

BIOGRAPHY

11.9–34 551.5:92

Kruthammer, Z., **Rudolf Feige: ten years after his death.** (In: Israel. Meteorological Service, **Book of ten years of the Meteorological Service of Israel.** Tel Aviv, **1958.** p. 9–10. In Hebrew. photo.) **DWB** (M(06) 185se)—The article commemorates RUDOLF FEIGE's untimely death ten years ago. He is rightly considered the pioneer meteorologist of Israel. When he came to Palestine in 1935 he already had had a brilliant meteorological career in Europe. In 1936 came the turning point in his life when the Palestine mandatory government decided to organize a synoptic forecasting service for aviation purposes. FEIGE was appointed to set up a meteorological service in Nov. 1936. The Service accordingly was set up and began operation by July 1937 in Jerusalem (later moved to Lydda). This pioneering meteorological effort was full of trying situations but he always retained his characteristic sense of humor. He saw to it that proper instruments were made available for meteorological work and took active interest in broadening the network of stations under the Hebrew University. The Service is a living memorial to his meteorological genius. *Subject Headings:* **1. Feige, Rudolf 2. Biography of Rudolf Feige 3. Israeli Meteorological Service.**—*I.S.*

11.9–35 551.5:92

Guttzeit, E., **[Obituary of] Max Grotewahl.** *Petermanns Geographische Mitteilungen*, Gotha, 103(1):38, **1959.** 2 refs. **DLC**—MAX GROTEWAHL (1894–1958) led the first German polar expedition after the first World War (1925). This expedition traversed northwest Spitzbergen from Magdalena Bay to Liefde Bay; also the use of a collapsible boat in the Arctic was introduced by him. In 1926 he founded the Archiv für Polarforschung and in 1931 he

began to publish the journal *Polarforschung*. *Subject Headings:* **1. Grotewahl, Max 2. Obituary of Max Grotewahl.**—*I.L.D.*

History

See: **Hist. of met., Albania** (Kasneci), 11.9-25; **Hist. of met., Ukraine** (Prickhot'ko), 11.9–26; **Hist. of oceanog.** (Thompson), 11.9-182.

B. APPLICATIONS

1. AERONAUTICS

11.9–36 551.582.2:629.139(481)

*Norway, Meteorologiske Institutt, **Climatological summaries for air navigation in Norway. June 1959.** 6 vol. each about 50–100 p. Almost entirely tables. Vol. 1, **Oslo Airport/Fornebu.** Vol. 2, **Oslo Airport/Gardermoen.** Vol. 3, **Stavanger Airport/Sola.** Vol. 4, **Kristiansand Airport/Kjevik.** Vol. 5, **Trondhiem Airport/Vaernes.** Vol. 6, **Bardufuss Airport. DAWS**—Monthly frequency tables for each of the stations named above, based on hourly observations, 1944–50. (A second series, based on data for 1951–60 is planned.) The tables contain frequencies of visibilities and low cloud heights, codes 0 to 9 (amount of low cloud is 4–9/10 and 10/10), separately, at each hour of the day; and combined (i.e., bivariate distributions), for 3-hourly periods of the day. Also given are wind speed-direction frequencies, and frequencies of haze, mist, fog, drizzle, rain, snow, sleet, showers, hail, and thunderstorms, by 3-hourly periods. In each volume the tables are preceded by a station history, with data on the exposure of the instruments, and a special table of basic climatic data based on the periods of record 1901–30 or 1946–55. The latter includes monthly values as follows: pressure, means and extremes; temperature, means, extremes, and days with frost; relative humidity, means and extremes; precipitation, mean, 24-hr maximum, number of days, and number of days with snow; snowdepth, means and extremes; and cloud, mean amount, and number of clear and cloudy days. *Subject Headings:* **1. Climatic data summaries 2. Airport climatic data 3. Norway.**—*R. S. Quiroz.*

11.9–37 551.5:629.13(02)

Parczewski, Władysław, **Meteorologia szybowcowa.** [Meteorology for gliders.] Warsaw, Wydawn. Ligi Lotniczej, **1953.** 244 p. 117 figs., 28 photos, 18 tables, 18 refs., 12 eqs. (*Biblioteka Szybowcowa Ligi Lotniczej*). **DWC** (TL761.P3)—A standard text on synoptic and aeronautical meteorology for glider pilots with many schematic diagrams illustrating cloud formations, thermals and other factors affecting aeroplane or glider flying. *Subject Headings:* **1. Aeronautical meteorology textbooks 2. Gliding meteorology 3. Thermals 4. Polish language.**—*M.R.*

11.9–38 551.509.3:551.511.6:629.13

Robert, Andre J., **A short discussion on the minimum time track.** *Canada. Meteorological Branch, CIR-3070*; TRA-25, July 9, **1958.** 15 p. 2 figs., table, 3 refs. **DWB, DLC**—In this paper a brief review of the theory of the minimum time track is given. The relation between the shape of the track and the vorticity field is outlined. Then it is shown that time economy on a short route is directly dependent on the ability to forecast vorticity. Actual vorticity forecasts are verified and the implications of the results discussed. *Subject Headings:* **1. Minimum flight time path 2. Forecasting vorticity.**—*Author's abstract.*

11.9–39 551.501.75

Willis, D. C. (*Trans-Canada Air Lines*), **Dead reckoning and wind finding accuracy over the North Atlantic.** *Institute of Navigation, London, Journal*, 11(3):282–289, **1958.** 6 figs., 2 tables, 5 refs. **DWB, DLC**—A discussion of recent accurate means of estimating wind speeds and the effective presentation and evaluation of the dead reckoning errors related to winds. Study was made by Trans-Canada Air Lines from Nov. 8, 1956 to March 16, 1957. *Subject Heading:* **1. Wind speed estimation accuracy.**—*N.N.*

11.9–40 551.510.53:551.5:37:629.1

Pan American World Airways, Atlantic Div., **Jet weather home-study course.** Ma **1958.** 10 lessons and supplementary training guide, each repaged. figs. Mimeo. **DWI** (M:629.13 P187je)—The course was prepared by the Atlantic Division Meteorological Sectio as part of the B-707 Training Programs and is designed to provide operations personnel wit the latest available information on weather features and techniques of analysis and forecastin in the levels between 25,000 and 40,000 ft. The course consists of ten (10) lessons and supplementary training guide. Questions to check assimilation of significant information ar attached to each lesson. *Subject Headings:* **1. Forecasting for jet aircraft 2. Training course in meteorology.**—*I.S.*

2. AGRICULTURE

See also: **Crop insurance, U.S.S.R.** (Ovchinnikov), 11.9–29; **Sr^{90} in wheat plants** (Lee), 11.9–56; **Environmental influences on crops** (King), 11.9–213; **Radiation obs. in rice fields** (Maruyama, Koshimura), 11.9–273.

11.9–41 551.582.1(477) 551.585.55(477)

*†Babich, A. D., **Klimaticheskie usloviia raïona stepnogo zapovednika Askaniia-Nova** [Climatic conditions in the region of the steppe reservation of Askaniia-Nova.] *Kharkov Universitet, Uchenye Zapiski*, Vol. 97 (Vol. 4 of Trudy of its Geograficheskiĭ Fakul'tet), issue **1958.** p. 151–185. 6 figs., 10 tables, 54 refs. **DLC** (AS262.K415)—A history of earlie investigations of the climate of Askaniia-Nova (located just north of the Crimean Peninsula is followed by a detailed exposition of the radiation balance and a discussion of the characte of the ground surface under the influence of various climatic factors. Circulation types an air masses determining the local weather are described, and data are given on the frequency and speed of movement of cyclones and on the extent of frontal activity. There follows detailed account of the local weather from season to season, supported by numerous table and graphs of monthly climatological data (based mainly on the period of record 1944–57) These include mean and extreme temperatures, mean evaporation and relative and absolut humidity, sunshine, and values for several components of the radiation balance; mean pre cipitation amounts, with extreme monthly amounts and 24-hour maxima; mean and maximum wind speeds and number of days with dry winds; and the usual data on the duration of frost and snowcover. Finally, detailed phenological data for several crops, and dates of beginnin and ending of field work are included. *Subject Headings:* **1. Climate of Askaniia-Nova 2. Steppe climates 3. Climatic data for Askaniia-Nova 4. Askaniia-Nova, Ukrainian S.S.R.** —*R. S. Quiroz.*

11.9–42 551.584.42(477):633.49

*†Dubinskiĭ, G. P., **Mikroklimat kartofel'nogo polia.** [Microclimate of a potato field. *Kharkov. Universitet, Uchenye Zapiski*, Vol. 97 (Vol. 4 of Trudy of its Geograficheskiĭ Fakul'tet), issued **1958.** p. 187–216. 16 figs., 5 tables, 25 refs. **DLC** (AS262.K415)—Tem perature and moisture requirements (soil and air) of potato plants, according to the findings of various authors, are discussed. The best environment for potato growing in the U.S.S.R. is in the northern lands near the Bering Sea. Past crop yields in the southern U.S.S.R. have been low, and measures to improve yields have been recommended. Conditions in 1953–55 in Kamenka-Dneprovskaia (southern Ukraine) are reviewed; here the Geography Faculty of Kharkov State University conducted an extensive microclimatological program during the three summers. Observations were taken in irrigated and nonirrigated fields, in both spring-planted and summer-planted crops. The observations included measurements of solar radiation; speed and direction of wind at heights of 0.5, 1, and 2 m; temperature and humidity at 0, 0.2 . . . , 2 m; and soil temperature at depths to 20 cm. The heat and radiation balance of a potato field is worked out, and data are given on the heat exchange and moisture content of the soil, and the heat and moisture exchange of the active layer with the air. The value of irrigation is borne out by comparisons of atmospheric and soil parameters and crop yields. *Subject Headings:* **1. Potato field microclimatology 2. Kamenka-Dneprovskaia, Ukrainian S.S.R.**—*R. S. Quiroz.*

11.9–43 551.524:551.573:581.11:633.491

Muminov, F. A., **O teplovom balanse deiatel'noĭ poverkhnosti kartofel'nogo polia.** [The thermal balance of the active surface of a potato field.] *Meteorologiia i Gidrologiia*, Leningrad, No. 8:36–40, Aug. **1958.** 3 tables, eq. **DWB, DLC**—The variation of the heat balance of the active surface of a potato field in the course of plant development was investigated by selecting three periods for spring plantings and four for winter plantings, each with dense stands. The experiments were carried out in 1955 at the Uzbek experimental potato farm near Tashkent. Data on the daily totals of the heat balance components in cal/cm² in the potato field averaged for the vegetation periods of plots of spring and summer plants, and on daily values of total evaporation, transpiration and evaporation from the soil surface averaged for the different vegetation periods, are presented in tables. The results indicate that (1) in the first period of vegetation the losses of heat by evaporation and expenditure of heat for heating the air are substantially similar; (2) in the second period the expenditure of heat for evaporation is still positive but insignificant in comparison with the heat expanded for heating the air; and (3) in the third period almost all the radiational heat and heat from the air is expended in evaporation, primarily transpiration. *Subject Headings:* **1. Thermal balance of earth's surface 2. Evaporation from soil 3. Evapotranspiration 4. Potato fields 5. Tashkent, U.S.S.R.**—*I.L.D.*

11.9–44 551.509.612:632.111.5:634.5 551.556.3:632.111.5

Saturn, Margaret, **Wind machine helps protect citrus groves.** *Florida. Agricultural Experiment Stations, Gainesville, Sunshine State Agricultural Research Report*, 3(3):10–11, July **1958. DWB**—A new method of protecting citrus trees from frost damage has been developed by a meteorologist. Frost master wind machines were used in 1957–58 for this successful experiment which is reported here briefly. The machines were effectively used at all levels. The author recommends their adoption. *Subject Headings:* **1. Frost protection of citrus orchards 2. Wind machines 3. Citrus orchards 4. Florida.**—*N.N.*

11.9–45 551.509.5:632.9:633.491

Pejml, Karel (*Agrometeorologicka Obs., Doksany*), **Příspěvek k agrometeorologické předpovědi plísně bramborové (Phytopthora infestans).** [Contribution to the agrometeorological forecasting of potato blight (*Phytophthora infestans*).] *Meteorologické Zprávy*, Prague, 12(2/3):54–57, **1959.** 9 figs., 5 refs. Russian and German summaries p. 54. **DWB, DLC**—Temperature and relative humidity are the significant meteorological factors in the occurrence of potato blight. For a more accurate evaluation of these factors comparative measurements were made (1957, 1958) in an instrument shelter (2 m above the surface) and in a potato field (20 cm). The correlations obtained for temperature and relative humidity at the two points are presented in scatter diagrams and nomograms (to be used in forecasting). A graph showing the effect of wind upon relative humidity in and above the field is also presented. *Subject Heading:* **1. Potato blight forecasting.**—*G.T.*

11.9–46 551.521.11:551.524:634.51

Sternes, G. (*U. S. W. B., Portland, Ore.*), **Sunshine and agriculture.** *U. S. Weather Bureau, Weekly Weather and Crop Bulletin*, Wash., D. C., 45(45):6–8, Nov. 10, **1958.** 2 figs. **DLC**—The role of light in photosynthesis is discussed in nontechnical language. The variability of light as dependent on atmospheric conditions and some practical considerations of the light factor are followed by an explanation of methods used in the measurement of light. A series of graphs from a 13-year study on the influence of weather upon walnut trees show the significance of light rather than temperature. The U. S. ratio of temperature records vs. light records is 40:1. Another graph features the total solar radiation 1951, 1953–1957 in average Langleys per minute for each of the months of the years. *Subject Headings:* **1. Sunshine effects on walnut trees 2. Temperature effects 3. Photosynthesis 4. Walnut trees.**—*W.N.*

11.9–47 551.579.5:551.577.38

Kulik, M. S., **Agroklimaticheskie pokazateli zasukhi.** [Agroclimatic indexes of drought.] In: U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Voprosy agrometeorologii,**

ed. by F. F. Davitaia and M. S. Kulik. Moscow, 1958. p. 70–75. 13 refs.)—Followin V. V. Dokuchaev, who attempted to characterize soil moisture conditions by the relationshi between precipitation and potential evaporation, numerous empirical formulas were develope so as to characterize drought conditions and intensity of potential evaporation and to provid an approximation of the probability of drought. The various formulas of G. Vysotskiĭ, N. N Ivanov, P. E. David, G. T. Selianinov, etc., which either compute potential evaporation o a drought coefficient are presented and their application is described. The use of crop yiel as an index of drought is not always a true index of climatic conditions as variations in agr cultural techniques are involved. The reduction of productive moisture supplies in the arabl layer to 20 mm is considered the beginning of the wilting period and to 10 mm the beginnin of drought. Drought in the arable layer influences all phases of crop development but es pecially formation of the shoot. Grains are particularly sensitive during the period of shoo and ear formation, when the reproductive organs begin to develop. Continuing drought or the absence of productive moisture in the meter layer, reduces the yield to zero. Th moisture accumulated in spring in the root zone of the soil is the principal source of moistur during the entire growing season. For the beginning of the sukhovei (hot-dry wind) th atmospheric moisture deficit is greater than 20 mm. When soil moisture is adequate, hard plants begin to experience reduction in growth when the moisture deficit is 26–35 mm. Beside increasing evaporation, the wind causes the swaying of the plants. The soil moisture reflect meteorological conditions for an extensive preceding period, the condition of the soil, and th state of agricultural technique. *Subject Headings:* **1. Drought indexes 2. Soil moisture** —*I.L.D.*

3. FORESTRY

11.9–48 551.584.41 551.588.6:551.524.

†*Rasche, Herbert H., **Temperature differences in Harvard Forest and their significance** *U. S. Quartermaster Research and Engineering Center. Environmental Protection Research Div. Technical Report, EP-80*, Jan. **1958.** 153 p. 11 figs. (incl. photos), 10 tables, numerous charts 234 refs. **DWB** (M86 U585t)—Temperature and snow depth data obtained in a micro meteorological network in Harvard Forest, Mass., during one year (1947–1948), are presente and analyzed. The stations were located in a great variety of environments, including forests clearings, swamps, ponds, etc. Effects of topography, elevation, sunshine, wind, vegetation water, and snow cover upon temperature are considered. Comparative data are presente for other New England locations. The climate of New England and weather developmen during the period of the study are described. *Subject Headings:* **1. Forest micrometeorolog 2. Micrometeorological observations 3. Micrometeorological networks 4. Forest tempera tures 4. Harvard Forest, Mass.**—*G.T.*

11.9–49 551.584.41:634.9

*†Ross, Philip, **Microclimatic and vegetational studies in a cold-wet deciduous forest** *Black Rock Forest Papers*, Cornwall-on-the Hudson, N. Y., No. 24, **1958.** 89 p. 29 figs. map, 32 tables, 43 refs. **DWB** (M(051) H339bL), **DLC** (SD359.B65A43)—The Harvar Black Rock Forest, situated in Orange County, N. Y., on the north side of the Hudson High lands, presents an ideal situation for studying vegetational composition and structure an microclimatic factors. During a period of sixteen months data on temperature and its vertica stratification, relative humidity, precipitation, soil moisture, and soil temperature were gathere from ten field stations and related to topography, soil, and vegetation. Six plant association were studied and mapped: mixed hardwood, hemlock-hardwood, *Quercus rubra*, *Quercus prinus Quercus ilicifolia*, and *Quercus alba-Carya glabra*. Precipitation values show a decided rain shadow effect on the Northern Slopes section where values averaged 40.62 inches for twelv months compared to values for Glycerine Hollow in the Highlands section which average 47.96 inches. The bottom of Glycerine Hollow where the monthly mean air temperatures fo the summer months averaged 65.9°F was the coolest area; the south slope of Glycerine Hollow recorded the lowest monthly average during the winter at 25.7°F. The lower north slope o Black Rock Hill recorded warmer average temperatures than any other station: 70.8°F during the summer and 28.4°F during the winter months. During the study, average relative humid

ties were higher and average temperatures were lower at the field stations than at Stewart Field, a nearby Air Force Base where regular, standard weather observations are collected. Soil temperatures followed the trends of the mean air temperatures except during the winter when the soil temperatures averaged 32°F. The soil moisture averaged higher on the north slopes than at Glycerine Hollow; runoff and evaporation are probably responsible. Glaze was found to be an important factor in tree development. Partial solutions for the causes of the distribution of the vegetation types are suggested. The mixed hardwood and the hemlock-hardwood associations are related to the deep till soils and the high soil moisture on the lower north slopes. *Tsuga canadensis* (Hemlock) is found predominantly in the cooler ravines. The *Quercus prinus* (Chestnut Oak) association is related to low soil moisture in the thin soils on the steep upper slopes. The *Quercus rubra* (Red Oak) association is related to the more mesic conditions on the lower more level slopes. The *Quercus ilicifolia* (Scrub oak) association found on the westerly sides of exposed hilltops is related to the dry conditions of the air and the soils in addition to lower average temperatures. The *Quercus alba-Carya glabra* (White Oak-Pignut Hickory) association is related to warmer soils, extremes in air temperatures, and low soil moisture. *Subject Headings:* **1. Forest microclimatology 2. Forest vegetation 3. Harvard Black Rock Forest, N. Y.**—*Author's abstract.*

11.9–50 551.515:551.579.4:595.79:582.47

Graham, Samuel A. and Satterlund, Donald R., **Weather, water levels, and larch sawfly cocoons.** *Forest Science*, Wash., D. C., 5(1):28–36, March **1959.** fig., 2 tables, 4 refs. **DWB**—The effect of weather upon sawfly cocooning (1930–1957) has been studied and interpreted in the light of observations on water levels and the activities of predatory mammals during the season of 1957. This study illustrates how insects react to their environments. *Subject Headings:* **1. Weather effects on sawflies 2. Water levels 3. Sawflies.**—*N.N.*

11.9–51 551.501.1:632.187(795)(02)

U. S. Weather Bureau, Portland, Oregon, **Instructions for Oregon fire weather observers. April 1957.** 12 p. 2 tables (Mimeo.). **DWB** (M01.0 U587inp)—Fire weather stations are operated to measure weather elements that are related to fire behavior. Accurate measurement of those elements is an important part of fire control. Information about fire weather is used: 1) to rate fire danger; 2) to report fire weather conditions to Weather Bureau forecasters; 3) for use in fire weather research. This manual contains detailed instructions for Oregon fire weather observers. The instructions pertain to Form 1009E dealing at length with time of observations, reading of instruments and observing the sky. Instructions also cover information about different forms for recording observations and how to take care of various instruments. Sample copy of Form 1009E and a wind velocity table are attached. *Subject Heading:* **1. Fire weather observers handbooks.**—*I.S.*

4. MEDICINE AND RADIOACTIVITY

11.9–52 551.586:61(08)

Jungmann, H. (*Hamburg, Germany*), **Tagungsbericht der 3. Medizin-Meteorologischen Arbeitstagung der Gesellschaft zur Förderung Medizin-Meteorologischer Forschung.** [Transactions of the 3rd Medical Meteorology Symposium of the Society for the Advancement of Medical Meteorological Research.] *International Journal of Bioclimatology and Biometeorology*, Leiden, Netherlands, Vol. 2 (Pt. 7), **1958.** 3 p. **DWB**—The symposium on medical meteorology, organized by the Society for the Advancement of Medical Meteorological Research, was held in Hamburg during June 13–15, 1957. Summaries of the papers delivered are presented. These include papers on the climatic regimes of Germany and their medical influences, convalescence responses and weather effects, especially of the circulatory system, the relationship between weather and thrombosis and embolism prophylaxis during operations, the reality of föhn disease, the relationship between traffic accidents and cyclogenetic phenomena, effect of atmospheric radioactivity upon man, etc. *Subject Heading:* **1. Medical meteorology symposia.**—*I.L.D.*

11.9–53 551.586:616

Picko, V., **Zum Problem des Meteorotropismus mancher Krankheiten.** [On the problem of the meteorotropism of some diseases.] *Angewandte Meteorologie*, Berlin, 3(7):211–219, June 1959. 3 figs., 16 refs. German summary p. 211. DLC—In continuation of a previous study on the influence of atmospheric environment upon the manifestation of particular diseases (*Angewandte Meteorologie*, Vol. 3, No. 2, 1957), the author examines the temporal and objective coincidence of meteorotropic diseases with the variation of meteorological elements by investigating the local long period normals of the elements from which interdiurnal variability of the observed deviation is derived. The sum of the deviations from the normal is in the case of selected biotropic meteorological factors, the expression of the condition of the environment and also a factor assumed to be influencing the human organism. In order to achieve homogeneity between the two sets of phenomena the pentad data on disease were compared with pentad data of the atmosphere for (1) the temperature minimum, the 1400 o'clock observations of air temperature, of atmospheric pressure, of physiological humidity, of cloudiness; (2) cooling power and (3) ground temperature conditions. These were expressed as daily totals of negative deviations and of algebraic deviation totals, of cooling power magnitude and of the condition of the soil. It is shown by means of specific statistical techniques that (1) at a particular locality and for a given period of time the development of glaucoma is significantly related to the cumulative pentad values of the algebraic deviations and of the cooling power, and (2) that for the increased manifestation of glaucoma the rise in the values of algebraic deviation totals and of cooling power suffices. Similar investigations have been carried out in other localities for osteoarthritis, polyarthritis and bronchial asthma. The statistical analyses are presented in tables and graphs. *Subject Headings:* **1. Weather effects on diseases 2. Biometeorology.**—*I.L.D.*

11.9–54 551.594.6:621.396:662.2:539.1(52)

Obayashi, T. (*Radio Res. Lab., Nakimato-shi, Ibaraki-ken*); Coroniti, S. C., and Pierce, E. T. (*both, AVCO Res. and Dev. Div., Wilmington, Mass.*), **Geophysical effects of high-altitude nuclear explosions.** *Nature*, London, 183(4673):1476–1478, May 23, 1959. 4 figs., 5 refs. DWB—It looks very convincing that the variation of fadeouts on frequencies of about 10–20 Mc/s and enhancement of atmospherics as recorded at Hiraiso, Japan, are directly linked to the nuclear weapon tests in Aug. 1958, at Johnston Island in the Pacific. Sources other than the nuclear tests are considered. Facsimile recordings are given. *Subject Headings:* **1. Nuclear explosion effects on radio propagation 2. Sferics sources 3. Hiraiso, Japan.**—*W.N.*

11.9–55 551.510.42:614.715 551.510.721:662.2:539.1

Pauling, Linus; Sakata, Shorchi et al., **Quelques précisions sur la nature et les propriétés des retombées radioactives résultant des explosions atomiques depuis 1945.** [Some particulars on the nature and properties of radioactive fallout resulting from atomic explosions since 1945.] *Académie des Sciences, Paris, Comptes Rendus*, 249(11):982–984, Sept. 14, 1959. 2 refs. DWB, DLC—The recent analyses of the nature and properties of radioactive fallout resulting from experimental atomic explosions permits the calculation of the rate of increase for certain elements. The accumulation of Sr^{90} at ground level increases yearly from 3 to 6 $\mu c/km^2$ since 1955. In Japan, at the end of July 1959, concentration reached 22 $\mu c/km^2$. Since 1954, the quantity of C^{14} in the atmosphere has been increasing regularly as much as 2% every year. It is thus more than 10% higher than the natural C^{14} content. The authors investigate the biological consequences of radioactive fallout. They guess that the radioactivity already emitted by experimental explosions will cause the death through leukemia and bone-cancer of 140,000 persons now living, and of a million people through various types of cancer. Concerning hereditary effects, it is believed that irradiation will provoke important genetic and somatic damages for many future generations. The authors think that each superbomb provokes through its fallout, the birth of 15,000 abnormal children. Past experiments have provoked about 140,000 abnormal births; C^{14} emitted until now is sufficient to cause 1,250,000 cases of abnormal children in the future. *Subject Headings:* **1. Radioactivity effects on leukemia 2. Carbon 14 in the atmosphere 3. Strontium 90 tropospheric storage. I. Tomonaga, Sin-Itiro II. Vigier, Jean-Pierre III. Yukawa, Hideki.**—*A.V.*

11.9–56 551.510.721:633.11

Lee, C. C. (*Dept. of Chem., Saskatchewan Univ. Saskatoon*), **Distribution of radioactivity n wheat plants grown in the presence of strontium-90.** *Science*, Wash., D. C., 129 (3358):1280, May 8, 1959. fig., table, 3 refs. **DWB**—Thatcher wheat grown in soil to which Sr^{90} had been dded showed that accumulation of radioactivity in the kernels was about one-tenth the ccumulation in leaves and stems. Experimental milling of the kernels gave brans with the argest amounts and flours with the least amounts of activity, the Sr^{90} concentrations being elated practically linearly to the weights of total ash in the various milling products. *Subject Headings:* **1. Strontium 90 in wheat plants 2. Radioactive plants 3. Wheat.**—*Author's bstract.*

5. INDUSTRY

See also: **Winds effects on buildings** (Farquharson), **11.9–298**; **Ships' hold climates** (Bullig), **11.9–327.**

11.9–57 553.98

*†Emery, Kenneth Orris, **Sea off Southern California: a modern habitat of petroleum.** N. Y., John Wiley, **1960.** 366 p. 248 figs. (incl. photos), 31 tables, bibliog. p. 329–350. **DLC** (GC83.E5). Review by P. E. Cloud in *Science*, Wash., D. C., 131 (3408):1212, April 22, 960—In order to thoroughly understand the manner of deposition and altercation of offshore etroleum, this book, divided in seven major chapters, synthesizes information concerning the asic environmental factors of the region: topography, structure, lithology, sediments, life, nd water movements. These factors are described. Their interrelationship is indicated, nd whenever possible, they are related to the general problem of origin and accumulation of etroleum. The book is nicely illustrated with maps and photographs. *Subject Heading:* **. Offshore oil deposits.**—*I.S.*

11.9–58 551.510.42:620.19

†Munn, R. E. (*Univ. of Michigan*), **Engineering meteorology: the weathering of exposed urfaces by atmospheric pollution.** *American Meteorological Society, Bulletin*, 40 (4):172–178, April 1959. 2 figs., 3 tables, 28 refs. **DWB, DLC**—The topic is approached from the view-oint of community air-pollution programs and control. After a brief discussion of the eco-omic costs of atmospheric pollution in an industrial area, a skeleton outline of the important actors in weathering by pollutants is presented. A few of the factors are considered in detail nder the general headings of soiling, erosion, and corrosion. Significant differences in weather-ng are found for industrial, rural, marine, and very dry climates. Most community surveys nclude routine tests of the dirtiness of the air but exclude corrosion tests, although this factor s of great economic importance. Methods of corrosion testing are considered, and it is oncluded that they are not feasible yet for community surveys. Increasing interest in cor-osion, however, is undoubtedly leading to a broader understanding of the problem. *Subject Headings:* **1. Atmospheric pollution control 2. Weathering by atmospheric pollution 3. Cor-osion.**—*Author's abstract.*

11.9–59 551.5:69 551.556.6:69

†National Research Council of Canada. Div. of Building Research, **Ten years of building esearch, 1947–1957.** Sept. **1957.** 120 p. 27 figs. Price: $1.00. Publications available rom the Div., p. 94–103. (*NRC* 4435). **DWB** (690 N277te)—An attractive pamphlet lescribing and illustrating the organization and the many activities of the Division of Building Research of the NRC of Canada. Among the research programs are: simulated wind and now load testing, climatically controlled test chambers, simulated rain against walls, soil noisture, wind, frost heaving and frozen ground problems, thermal properties of materials, now depths, climatic maps for the National Building Code and atlas. Seven atmospheric xposure test sites are shown on a map, extending from Norman Wells to Vancouver Island nd Halifax. Effect of weather elements, atmospheric pollution and gases, and weathering f plywood are studied. Snow survey stations reach from extreme north to southwest and outheast. *Subject Headings:* **1. Building research 2. Wind pressure on structures 3. Weath-ring of materials 4. Canada.**—*M.R.*

11.9–60 551.556.6:694.4

Pagon, W. Watters (*Consulting Engineer, Baltimore*), **Wind forces on structures; plate girders and trusses.** *American Society of Civil Engineers, Structural Div., Journal*, Vol. 84, Paper 1711, July **1958.** 29 p. 9 figs., 16 refs. **DWB**—The committee on wind forces submits a report on the nature and velocity of the wind that acts to cause normal, vertical and longitudinal forces, also movements about axes, longitudinal and normal to the trusses. *Subject Heading:* **1. Wind pressure on structures.**—*N.N.*

11.9–61 551.584.3:551.586:628.8

Parry, M. (*Univ. of Reading*), **Local climates and house heating.** *Advancement of Science*, London, 13(52):326–331, March **1957.** 4 figs., 8 refs. **DLC**—Some recent local climatic studies (temperature and wind force), from the standpoint of the heating and ventilating engineer, are assessed in terms of difference in heat loss from dwellings attributable to local topography and/or the presence of built-up areas. The study is based on recordings from two stations. These processed and combined with annual degree-day values enables calculations of the heat loss over a 12-month period by a formula given. *Subject Headings:* **1. Local climatic studies 2. Heating of houses 3. Heat loss from buildings.**—*W.N.*

11.9–62 551.586:725.74:628.8

Root, Douglass E., Jr. (*Consultant, Orlando, Fla.*), **A simplified engineering approach to swimming pool heating.** *Solar Energy*, Phoenix, Ariz., 3(1):60–63, Jan. **1959.** table, 4 refs., eqs. **DWB**—A knowledge of the heat losses from swimming pools is important in designing pool heaters. This paper gives a brief description of possible heating means and a simplified analysis of the method of correlating climatological data with heat losses, with formulas and explanations in sufficient detail to allow the engineer to make a fairly accurate estimate of what those losses will be. An understanding of the magnitude of the various types of losses may be of value to the pool designer and architect in assisting them to find new design methods which will reduce these losses. *Subject Headings:* **1. Heat loss from swimming pools 2. Swimming pool heaters.**—*Author's abstract.*

C. ASTRONOMY AND ASTROPHYSICS

1. ASTROPHYSICS

See also: **Handbook of astrophysics,** 11.9–1; **Close binary systems** (Kopal), 11.9–8.

11.9–63 523.15:54

Voigt, H. H., **Die Häufigkeit der Elemente im Kosmos: Gesetzmässigkeiten der allgemeinen Verteilung.** [The abundance of the elements in the cosmos: regularities of the general distribution.] *Umschau*, 57(2):37–39, Jan. 15, **1957.** fig., 2 tables. **DLC**—Although the known material is a vanishingly small part of the cosmos, "samples" agree among themselves and with theory. Information is derived from meteorites, atmospheres of stars and sun, planetary nebulas and interstellar material. The logarithms of abundance of elements are tabulated, by far the most common being hydrogen and helium, followed by oxygen and neon. Except for hydrogen, elements with even atomic numbers are more common than those with odd numbers. The origin of the elements is briefly discussed. *Subject Heading:* **1. Cosmic structure.**—*C.E.P.B.*

11.9–64 523.12

Berlage, H. P., **De ouderdom van het zonnestelsel.** [The age of the solar system.] *Hemel en Dampkring*, The Hague, 56(3):37–42, March **1958.** **DLC**—The paper gives some comments about the investigations of geologists and treats of the determination of the age of the solar system by radioactivity. The author reviews the earth's evolution from the beginning. A statement about solar systems, meteorite systems and the moon completes this paper. *Subject Heading:* **1. Age of solar system.**—*A.V.*

11.9–65 550.311 523.2

Brown, Harrison, **The age of the solar system.** *Scientific American*, 196(4):81–94, April **1957.** 16 photos, 6 tables. **DWB, DLC**—A graphical and descriptive summary of the present knowledge of the age of the earth and the universe as derived from radioactive isotopes, etc. The conclusion is that the solar system is 4.5 billion years old and the material of which it is composed at least 400 million years older, making it from 4.9 to 6.0 million years old. *Subject Headings:* **1. Age of solar system 2. Age of earth.**—*M. R.*

11.9–66 523.855

McVittie, G. C. and Wyatt, S. P. (*both, Univ. of Illinois Obs.*), **The background radiation in a Milne universe.** *Astrophysical Journal*, Chicago, 130(1):1–11, July **1959.** table, 19 refs., 47 eqs. **DWB, DLC**—The flux density from all unresolved galaxies in the universe is considered. Calculation of this quantity depends on the luminosity function and the spectrum function of the sources and also on the general motion of recession. It is shown that the spectrum function and the model of the universe must be given a priori if the calculation is to be possible. The particle spectrum functions discussed here imply uniformity of radiating sources; Milne's model of the universe is selected so as to include recessional, and omit gravitational, effects. For radio sources the spectrum is assumed to be proportional to an inverse power of the frequency. The total flux density is computed for a Milne universe and compared with that from a partly filled static Newtonian universe. Comparison with observation leads to the radio power per unit volume emitted by sources in a Milne universe. For optical sources a black-body spectrum is assumed. Very distant galaxies whose optical radiation is red-shifted to radio frequencies contribute a negligible amount to the radio flux density. The possibility and problems of observing the background flux density from the universe at optical frequencies are also discussed. *Subject Headings:* **1. Galactic radiation 2. Milne universe.**—*Authors' abstract.* ⑤

11.9–67 523.03:538.69

Chandrasekhar, S. and Fermi, E. (*Chicago Univ.*), **Problems of gravitational stability presence of a magnetic field.** *Astrophysical Journal*, 118(1):116–141, July **1953.** 2 figs., 2 tables, 7 foot-refs., 173 eqs. **DWB**—In this paper a number of problems are considered which are related to the gravitational stability of cosmical masses of infinite electrical conductivity in which there is a prevalent magnetic field. In Sec. I the virial theorem is extended to include the magnetic terms in the equations of motion, and it is shown that when the magnetic energy exceeds the numerical value of the gravitational potential energy, the configuration becomes dynamically unstable. It is suggested that the relatively long periods of the magnetic variables may be due to the magnetic energy of these stars approaching the limit set by the virial theorem. In Sec. II the adiabatic radial pulsation of an infinite cylinder along the axis of which a magnetic field is acting is considered. An explicit expression for the period is obtained. Sec. III is devoted to an investigation of the stability for transverse oscillations of an infinite cylinder of incompressible fluid when there is a uniform magnetic field acting in the direction of the axis. It is shown that the cylinder is unstable for all periodic deformations of the boundary with wave lengths exceeding a certain critical value, depending on the strength of the field. The wave length of maximum instability is also determined. It is found that the magnetic field has a stabilizing effect both in increasing the wave length of maximum instability and in prolonging the time needed for the instability to manifest itself. For a cylinder radius $R=250$ parsecs and $p=2\times10^{-24}$ gm/cm^3 a magnetic field in excess of 7×10^{-3} gauss effectively removes the instability. In Sec. IV it is shown that a fluid sphere with a uniform magnetic field inside and dipole field outside is not a configuration of equilibrium and that it will tend to become oblate by contracting in the direction of the field. Finally, in Sec. V the gravitational instability of an infinite homogeneous medium in the presence of a magnetic field is considered, and it is shown that Heans's condition is unaffected by the presence of the field. *Subject Heading:* **1. Astrophysics.**—*Authors' abstract.*

11.9–68 537.56:538.69:532.59 551.521.67:621.396.8

Cole, K. D. (*Antarctic Div., Dept. of External Affairs, Melbourne*), **Electro-hydromagnetic waves in a fully ionized gas, Pt. 1.** *Planetary and Space Science*, N. Y., 1(4):319–324, Sept.

1959. fig., 13 refs., 28 eqs. **DWB, DLC**—Transport equations are used to determine coefficients which are generalizations for any frequency of electric field of the parallel, Pedersen and Hall conductivities in a fully ionized gas. These coefficients are used in an investigation of the propagation of weak electromagnetic and hydromagnetic waves of all frequencies across a homogeneous and constant magnetic field in a rarefied fully ionized gas. For propagation perpendicular to the magnetic field it is found for all frequencies

(i) $$\frac{\omega^2}{k^2} = c^2 \frac{\tau\left(\frac{V^2}{c^2}\omega p^2 - \omega^2\right) + \iota\omega}{\tau(\omega p^2 - \omega^2) + \iota\omega},$$

(ii) $$\tfrac{1}{2}p|v|^2 = V^2 \cdot \frac{|k|^2}{\omega^2} \cdot \frac{|h|^2}{8\pi}$$

where $V^2 = H^2/4\pi p$ and v, h are the perturbations of the velocity, magnetic field. Similar relationships are deduced for propagation at any angle to the field for frequencies greater than about 10 times the gyro-frequency of electrons. The theory is applied to discuss transmission of disturbance across the interplanetary medium, the temperature of the solar corona and the earth's outer atmosphere, the emission of nonthermal solar radio noise, cosmic radio noise and the anomalous emission of light from shock fronts. *Subject Headings:* **1. Electro-hydromagnetic waves 2. Magnetic field effects 3. Astrophysics.**—*Author's abstract.* Ⓢ

11.9–69 537.314:538.69:532.59

Williams, W. E. (*Liverpool Univ.*), **Reflection and refraction of hydromagnetic waves at the boundary of two compressible media.** *Astrophysical Journal*, Chicago, 131(2):438–441, March 1960. 2 refs., 17 eqs. **DWB, DLC**—The reflection and refraction of a hydromagnetic plane wave at a plane boundary between two semi-infinite homogeneous media of infinite electrical conductivity are discussed when a uniform magnetic field perpendicular to the plane of separation is present. It is shown that, if the incident wave is not an Alfvén one, there will be at most two reflected and two refracted plane waves and that, for the case of an incident Alfvén wave, there will be only one reflected and one refracted wave. It is also shown that a general solution of the hydromagnetic equations may be obtained in terms of two independent scalar fields. *Subject Headings:* **1. Electro-hydromagnetic waves 2. Magnetic field effects.**—*Author's abstract.* Ⓢ

2. SOLAR PHYSICS

See also: **Solar-terrestrial relationships** (Ellison), 11.9–6; **Corpuscular radiation from sun** (Kozyrev), 11.9–91; **Solar effects on cosmic rays** (Neher), 11.9–115; **Solar proton flux** (Osterbrock), 11.9–128; **Solar photography** (Schwarzschild, Schwarzschild), 11.9–201.

11.9–70 523.7

Sears, R. L. (*Indiana Univ.*), **An evolutionary sequence of solar models.** *Astrophysical Journal*, Chicago, 129(2):489–495, March 1959. 2 figs., 2 tables, 19 refs., 18 eqs. **DWB, DLC**—A sequence of solar models has been computed, covering 4.5×10^9 years at intervals of 1.5×10^9 years. The initial composition and extent of convective envelope have been partially fixed with reference to the age-zero main sequence of SANDAGE (1957). It is found that the decrease in hydrogen content at the center is 33% and the increase in total luminosity is 42% in the assumed time interval. An inhomogeneous model with a single 4.5×10^9-year time step is found to differ little from the last model of the sequence, thus strengthening the work of SCHWARZSCHILD, HOWARD, and HÄRM (1957) and WEYMANN (1957). Revised interpolation formulas for the opacity and energy generation are used. *Subject Heading:* **1. Solar models.** —*Author's abstract.* Ⓢ

11.9–71 523.7 541.126 535.33

Chadeau, Claude, **Soleils en laboratoire.** [Suns in the laboratory.] *L'Astronomie*, Paris, 72(12):509–513, Dec. 1958. **DLC, NNC**—In this article, especially intended for stu-

dents, the author explains the various researches carried out in order to obtain energies and temperatures comparable with those of the Sun. As concerns thermonuclear reactions he distinguishes fission and fusion of the nuclei. Statement of the principle of fusion and of its practical realization and description and functioning of the Zeta pile at Harwell are included. The last paragraph is devoted to the spectral methods of measuring high temperatures. *Subject Headings:* **1. Solar models 2. Thermonuclear reaction 3. Zeta pile 4. Harwell, Eng.**—*A. V.*

11.9–72 551.521.9:621.396.8:523.74

Peterson, L. E. and Winckler, J. R. (*both, School of Physics, Univ. Minn., Minneapolis*), **Gamma-ray burst from a solar flare.** *Journal of Geophysical Research*, Wash., D. C., 64(7): 697–707, July **1959.** 7 figs., 3 tables, 16 refs. **DLC**—A burst of high-energy radiation coincident with a solar flare has been detected during a balloon flight at 10 gm/cm² atmosphere depth and 30° geomagnetic latitude over Cuba. The flare occurred at 1305 U.T. on March 20, 1958 and was associated with solar radio bursts on 1,500 and 10,000 Mc/s. Terrestrial effects included a SID, earth-current disturbances, and a magnetic crotchet. The 18-sec. burst was detected with an integrating ionization chamber and a single Geiger counter. From these two instruments and their ratio, it is inferred that the radiation is due to a gamma-ray flux of about 2×10^{-5} ergs/sec cm² peaked in the 200- to 500-Kv region. This radiation can be interpreted as bremsstrahlung produced in the solar photosphere from electrons of 0.5 to 1 Mev energy. These same electrons, spiraling in a 1000-gauss field in the flare region, can produce the observed radio burst by betatron radiation. The high-energy electrons represent about 1% of the flare energy. Only about 0.01% of the emitted betatron radiation escaped from the flare region toward the earth. *Subject Headings:* **1. Solar radio bursts 2. Solar flares 3. Cuba.**—*Authors' abstract.* Ⓢ

11.9–73 523.72 551.521.67:551.510.53

Chapman, Sydney, **The earth in the sun's atmosphere.** *Scientific American*, N. Y., 201(4):64–71, Oct. **1959.** 10 figs. (incl. photos). **DWB, DLC**—The magnitude of our Earth and the extent of its surrounding atmosphere as well as the density of the solar atmosphere is discussed. Although a knowledge of the physical Earth and of the astronomical sciences associated with the earth dates back over 2000 years, little was known of the significance of the conductivity that exists between the earth's and the sun's atmospheres, their electron densities and of the violent prominences in the photosphere that emit energy which, in turn, is carried away by convection within the solar atmosphere. The present report covers the achievements made along these lines during the IGY. It describes numerically the density and intensity of the electrons in the solar atmosphere, turbulent waves and temperature rises within the solar region. Close to our earth it is recorded that over 9000 electrons, and the same number of protons, per cu in. exist. This means that in the interstellar space these figures range from 10 to 200 per cu in. The article indicates that the hot energizing solar gas steadily streams into our earth's atmosphere and the deflected particles of such gases give birth to the observed luminous aurora. Some of it is trapped in the outer belts of the atmosphere. Photographs of the corona, the zodiacal light, etc. as well as graphical illustrations of the earth's temperatures in degrees Kelvin, the electron densities per cu in. and the reflection of radio waves from the ionosphere as recorded in the Propagation Laboratory in Boulder, Colo. are included. *Subject Headings:* **1. Solar atmosphere 2. Earth's atmosphere.**—*N. N.* Ⓢ

11.9–74 551.506.22:523.74

*International Geophysical Year, 1957/1958. IGY World Data Center A [for] Solar Activity, High Altitude Observatory, Boulder, Colo., **Intermediate reports of surges and active prominence regions, Oct.–Dec. 1958.** Its *IGY Solar Activity Report Series*, No. 7, June 1, **1959.** unpaged (1 p. per day). Entirely tables. Also **Jan.–March 1959.** *Ibid.*, No. 8, Sept. **1, 1959.** unpaged. Entirely tables. Also **April–June 1959.** *Ibid.*, No. 9, Feb. 22, **1960.** unpaged. Entirely tables. **DWB** (523.74 1612so)—These are the original, uncorrected data compiled from the daily reports of various observations during the period Oct. 1958 to June 1959. *Subject Headings:* **1. IGY solar program 2. Solar data.**—*N. N.* Ⓢ

11.9–75 523.741:535.34

†Mitchell, Walter E., Jr. (*Ohio Wesleyan and Ohio State Univ.*), **The distribution of electron pressure in the solar photosphere.** *Astrophysical Journal*, Chicago, 129(2):369–374, March **1959.** fig., 2 tables, 14 refs., 4 eqs. **DWB, DLC**—In this paper a hydrostatic model of the solar photosphere is integrated in monochromatic optical depth at three infrared wave lengths, utilizing a recent determination of the metals abundance, log $A = 4.28$. In the line-forming region the electron pressure is lowered approximately 50% with respect to that in the modified Aller-Pierce model. There is a good agreement between the models at λ8000 and λ11,000 and the model at λ16,000. Consequently, the present theoretical values for the free-free contribution to the negative hydrogen-ion absorption are probably not in error by any significant amount. *Subject Headings:* **1. Photospheric absorption 2. Photosphere.**—*Author's abstract.* Ⓢ

11.9–76 523.745

Steen, Odd and Maltby, Per, **On the correlation between observations of magnetic fields of sunspots at Mt. Wilson, Potsdam and the Crimea.** *Astrophysica Norvegica*, Oslo, 6(10):113–122, Sept. **1959.** 4 figs., 13 refs. **DWB**—A comparative study has been made of the magnetic fields of sunspots made at Mt. Wilson, Potsdam and the Crimea. As only few simultaneous observations are available at present, some of the results should be re-examined with sufficient statistical material. The correlation coefficient and the regression lines are determined for two observatories at a time. *Subject Headings:* **1. Solar magnetic fields 2. Sunspots.**—*Authors' abstract.* Ⓢ

11.9–77 523.745

†Howard, Robert (*Mt. Wilson & Palomar Obs.*), **Observations of solar magnetic fields.** *Astrophysical Journal*, Chicago, 130(1):193–201, July **1959.** 7 figs. (incl. photos), table, 30 refs. **DWB, DLC**—The magnetograph at the 150-ft solar tower at Mount Wilson Observatory was used to trace a number of active and quiet regions on the surface of the sun with an angular resolution of about 10 sec. of arc. It was found that magnetic features exist near sunspots with fields exceeding 75 gauss. Changes in the magnetic features, as seen from magnetic contour maps made on different days, were frequent. The flux measured near spots was in most cases sufficient to balance the flux from the spots. There is good evidence for a tilting of the lines of force of the photospheric magnetic field in the direction of a sunspot. Magnetic contour maps show that magnetic features bear a close resemblance to calcium-plage regions. In all cases the plages were outlined very nearly by a 10-gauss contour line. Where filaments (prominences) were present in regions removed from plages, in all cases it was found that they occurred in areas where the field was less than 10 gauss. Moreover, the magnetic features on either side of the filaments were always of different polarities. It is suggested that the magnetic field in the solar photosphere and chromosphere is in the form of more or less vertical columns. *Subject Headings:* **1. Solar magnetic fields 2. Sunspots.**—*Author's abstract.* Ⓢ

11.9–78 523.745

Leighton, Robert B. (*Calif. Inst. of Tech.*), **Observations of solar magnetic fields in plage regions.** *Astrophysical Journal*, Chicago, 130(2):366–380, Sept. **1959.** 10 figs. (incl. photos), 3 refs. **DWB, DLC**—A new method of mapping the solar magnetic field is described, and preliminary results are presented. Relatively strong fields, up to 100 or 200 gauss in strength are found in extensive areas throughout plage regions, the field pattern being in striking agreement with the pattern of Ca II emission. A plausible mechanism of excitation of the Ca^+ ions is described, and some possible consequences of this mechanism are briefly discussed. *Subject Heading:* **1. Solar magnetic fields.**—*Author's abstract.* Ⓢ

11.9–79 523.745

Babcock, Harold D. (*Calif. Inst. of Technology*), **The sun's polar magnetic field.** *Astrophysical Journal*, Chicago, 130(2):364–365, Sept. **1959.** graph (fold), 3 refs. **DWB, DLC**—The polarity of the high-latitude dipolar magnetic field of the sun was opposite to that of the earth's field from 1953 to 1957. About the middle of 1957, the polarity of the magnetic field near the south heliographic pole was reversed; reversal of the field near the north pole was not observed until Nov. 1958. At present, the sun's polar field is parallel to that of the earth. *Subject Heading:* **1. Sun's polar magnetic field.**—*Author's abstract.* Ⓢ

11.9–80 523.746:551.509.318

Baur, Franz, **Neue Untersuchungsergebnisse über die Zusammenhänge des Grosswetters mit dem Sonnenfleckenzyklus.** [Recent results of research on the connection between large-scale weather with the sunspot cycle.] *Geofisica Pura e Applicata*, Milan, 44:303–314, Sept./Dec. **1959.** 2 figs., 2 tables, 9 refs. English, French and German summaries p. 303–304. **DLC**—The study presents new evidence for the fact that approximately two years prior to the occurrence of maxima and minima of the sunspots, also 1¼ to 2 years after the occurrence of maxima, the subtropical high-pressure belts are strengthened and shifted toward the poles, and further that the pressure gradient increases from the high pressure belt toward the polar region in the summer of the Northern Hemisphere. Based on the summerly amounts of precipitation in Central Europe and average summerly atmospheric pressures in Edinburgh, the intervals of the sunspot cycle. during which the subtropical high-pressure belt is shifted toward the poles, are determined more precisely. The distance of beginning and end of these intervals from the nearest sunspot extreme is expressed in fractions of the distance from the preceding sunspot extreme to the following one, rather than in years. Thus, the departures in anomalous sunspot cycles find their explanation. Finally, a chart shows the average annual rings of 10 Central European spruces during a period of almost 200 years. This chart clearly demonstrates the incorrectness of the assertion that the 11-year sunspot period can be found in annual rings of old trees. This is at least not true in Central Europe. On the other hand, the chart expresses well the double or triple variation of precipitation within the sunspot cycle. *Subject Heading:* **1. Sunspots and weather.**—*Author's abstract.* Ⓢ

11.9–81 523.746:551.510.535:621.396.1

Chappell, D. W. G. (*Dominion Physical Lab., New Zealand*), **A relationship between the life of M-regions and the rate of change of solar activity.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 315–319, Feb. **1960.** 3 figs., 7 refs. **DLC**—To test the hypothesis that the observed lack of success in forecasting disturbances to radio propagation by using the recurrence pattern during the 1953–1954 sunspot minimum period is due to the high rate of decay of the 1947–1954 cycle of solar activity, magnetic character figures for the period 1890–1950 were examined. A numerical definition of "persistence of recurrence" is given and a linear relationship is obtained between the maximum value of this quantity at sunspot minimum and the rate of decay of solar activity to that minimum. The extremely low value of this quantity predicted by this relationship for the 1954 sunspot minimum period is considered to provide confirmatory evidence for the initial hypothesis. *Subject Heading:* **1. Sunspot-radio propagation relationships.**—*Author's abstract.* Ⓢ

11.9–82 523.746:519.241.1

Loewe, Fritz and Radok, Uwe (*both, Dept. of Met., Univ. Melbourne*), **On the annual cycle in the sunspot numbers.** *Beiträge zur Geophysik*, Leipzig, 68(6):342–353, **1959.** 3 figs., 6 tables, 9 refs., 4 eqs. English and German summaries p. 342. **DWB, DLC**—The monthly mean sunspot numbers averaged for the years 1867–1953 show the annual cycle with maximum in summer first noted by L. A. Bauer in 1921. After normalization of the frequency distribution of the sunspot numbers by means of a square root transformation the vectors representing the annual harmonics fitted to individual years resemble a coherent random variable with its characteristic intermittent persistence. Of the principal explanations advanced for a spurious annual sunspot cycle, only that in terms of the curvature due to the main cycle is found to be valid, but this curvature itself shows only intermittent persistence, even in sign. It is concluded that essentially the annual sunspot variation must be regarded as a random phenomenon reflecting the continuous spectrum of oscillations commonly associated with autocorrelated time series. *Subject Heading:* **1. Sunspot numbers.**—*Authors' abstract.* Ⓢ

3. PLANETS

11.9–83 523.4:621.396.8

Smith, Alex G. and Carr, T. D. (*Dept. of Physics, Univ. of Florida*), **Radio-frequency observations of the planets in 1957–1958.** *Astrophysical Journal*, Chicago, 130(2):641–647,

Sept. 1959. 3 figs., 7 refs. **DWB, DLC** —Analysis of all the available observations, including data obtained at this Observatory during the 1957–1958 apparition, indicates that the Jupiter radio sources continue to rotate with a uniform period of $9^h55^m29^s.8$. Measurements of the polarization of the radiation seem to confirm the existence of a Jovian magnetic field. Radio observations of Venus and Uranus have given negative results, whereas there is some evidence of sporadic radiation from Saturn. *Subject Heading:* **1. Radio observation of planets.**—*Authors' abstract.* Ⓢ

11.9–84 523.4:523.152.2

Wildt, Rupert (*New Haven, Conn.*), **Das Innere der Planeten.** [The core of planets.] *Naturwissenschaftliche Rundschau*, Stuttgart, 12(5):165–170, May 1959. 4 figs., 11 refs. **DWB, DLC**—The measurement of compressibility of firm hydrogen and helium, up to 20,000 atmospheres, was decisive for the knowledge of the core of the Jupiter-type planets. The knowledge of relation of pressure and density in bodies of higher mean density is not advanced as far as to warrant a theory, different from the traditional one, on the core of the Earth-type planets. It is plausible that the hydrogen and helium gas of Jupiter is condensed to an ocean-like liquid form on its surface. Diagrams show the group of planets distinctive according to the relation of their density and mass; the density of isotherm atmospheres of pure hydrogen, and the relation of mass and radius for balls of firm hydrogen. The bibliography lists the theories discussed. *Subject Headings:* **1. Planetary cores 2. Interstellar medium.** —*O.T.* Ⓢ

11.9–85 523.43:535.24

De Vaucouleurs, G. (*Harvard College Obs., Cambridge*), **Multicolor photometry of Mars in 1958.** *Planetary and Space Science*, N. Y., 2(1):26–32, Oct. 1959. 6 figs., 7 tables, 9 refs., eqs. **DWB**—Photoelectric observations of Mars in Oct. and Nov. 1958 at the Lowell Observatory give values of the stellar magnitude and integral albedo at five wave lengths from $\lambda 3300$ to $\lambda 6900$. In the near ultraviolet $3000 < \lambda < 4000$ Mars is "grey" and very dark, with a nearly constant albedo $A = 0.046$. Earlier Mount Stromlo and Flagstaff data are also discussed. *Subject Headings:* **1. Photoelectric observation of Mars 2. Albedo of Mars 3. Mars.**—*Author's abstract.* Ⓢ

11.9–86 523.43

†Katterfel'd, G. N., **K voprosy o tektonicheskom proiskhozhdenii lineĭnykh obrazovaniĭ Marsa.** [Tectonic origin of the linear formations on Mars.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 91(3):272–283, May/June 1959. 5 figs., 5 tables, 30 refs. **DLC**—An analysis of the statistics of the Martian "canals" and their azimuthal distribution reveals that they are more numerous in the southern than in the northern hemisphere. This corresponds to the greater number of "cases" in the southern hemisphere and to the greater area of the marine submergence of the southern half of Mars. Hence the canals appear to be associated with the cases not only locally but also genetically. In the northern hemisphere a north-east concentration of the canals predominate while in the southern hemisphere a south-east one predominates. In both hemispheres the canals inclining to the east are more than $1\frac{1}{2}$ times more numerous than those inclining to the west. An examination of the fractures and fissures on the surface of the moon indicates that in both hemispheres meridional fractures predominate over latitudinal ones and in the diagonal system of the northern hemisphere north-east directions are more frequent while in the southern hemisphere the south-east direction prevails over the south-west. The lunar fractures indicate the presence of a mobile and plastic subcone layer deforming the solid outer envelope as a result of tidal and rotational action; and the process of fracturing is associated with mountain formation. The Martian "canals" resemble the African rift valley. The arid nature of the Martian surface and the probable absence of extensive sedimentary deposits favor more plastic rocks on the surface of the planet and hence a straight line axial extension of fractures in contrast to crustal deformation characteristics of the earth. The prevailing direction of linear structure of Mars corresponds to the figure and the position of the axis of rotation of the planet. This also indicates the endogenous origin of the "canals". The "canals" are zones of tectonic rifts nourishing plant zones and "cases" with tectogenic deep waters. On the basis of an analysis analogous to the origin of tectonic fractures on the surface of the earth, of the azimuthal statistics of

"canals" of Mars and of the roses of the fractures of Mars and of the moon it is concluded that the tectonic origin of the "canals" of Mars is associated with the variable total compression and is determined by the uneven rotation of the planet and the lines and oases can be regarded as centers of tectonic deformation. The distribution of the centers of deformation on the surface of Mars is determined by pulsations of the form of the planet accompanied by its uneven rotation. The "oceanicity" of the southern hemisphere and the contraction of the Martian "seas" from north to south is homologous to the oceanicity of the southern hemisphere and contraction of the continents of the Earth to the south and have the same general cause—the asymmetric figure of the planet relative to the plane of the equator. The tectonic character of the planet is associated with its unequal gravitational compression and rotation. *Subject Heading:* **1. Martian canals.**—*I.L.D.* Ⓢ

11.9–87 523.164.3

Ovenden, Michael W., **Some recent planetary investigations.** *Science Progress*, London, 43(172):648–654, Oct. **1955. DWB** –1. Markings on Mars may be due to vegetation adapted to its extreme climate. An alternative explanation is that they are dust, probably volcanic, carried by the permanent wind systems. 2. Radio emission bursts from Jupiter on 22 Mc/s are probably due to thunderstorms with rare but intense lightning flashes. 3. Magnetic storms on Venus are attributed to solar corpuscular streams. *Subject Headings:* **1. Mars 2. Radio emissions from Jupiter 3. Magnetic storms on Venus.**—*C.E.P.B.*

11.9–88 523.43

Sinton, William M. (*Lowell Obs., Flagstaff*), **Further evidence of vegetation on Mars.** *Science*, Wash., D. C., 130(3384):1234–1237, Nov. 6, **1959.** fig., table, 8 refs. **DLC** —During the 1958 opposition, improved equipment indicated the presence of large organic molecules by infrared-spectroscopic tests. Spectra were obtained on 13 mornings from Oct. 7 to 21 and during the first half of the night of the 21st. Thirty-two spectra were obtained of various regions of Mars with 1-mm apertures. Five spectra were obtained with 1-mm slits that traversed the region of Syrtis Major. No new absorptions other than the organic bands were found on Mars. The observed spectrum fits very loosely, that of organic compounds and particularly that of planets. It is tempting to assume that the dark region also contains organic molecules. The strength of the band at 3.67μ compared to its weakness or absence in plants may indicate a significant difference in plants that may be present on Mars. *Subject Headings:* **1. Martian vegetation 2. Infrared spectroscopy.** —*E.K.* Ⓢ

11.9–89 523.43

Wanders, A. J. M. (*Venlo, Helbeeck, Netherlands*), **The physical conditions on the planet Mars.** *International Astronautical Congress, Amsterdam, Aug. 1958, Proceedings of the 9th Congress*, Vol. 1:394–404, issued **1959.** 4 figs. (incl. photos), 11 refs. English, German and French summaries. **DLC** (TL87.I44)—A survey is given of our present knowledge about the planet Mars as revealed by visual and astrophysical observations. The various points discussed are the constitution of the atmosphere and some of its implications, the nature and behavior of the snow caps at the poles, the bright desert regions and the dark markings that occur mainly on the southern hemisphere, some of which are of variable extent. Attempts that have been made to interpret the latter, among which the hypothesis of vegetation is the most intriguing, are also discussed. *Subject Heading:* **1. Martian atmosphere.** —*Author's abstract.* Ⓢ

11.9–90 621.396.8:523.45

†Field, George B. (*Princeton Univ. Observ.*), **The source of radiation from Jupiter at decimeter wavelengths.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1169–1177, Sept. **1959.** 2 tables, 25 refs., 14 eqs. **DLC**—The flux of radiation from Jupiter at decimeter wave lengths is relatively large, and is approximately independent of wave length in the interval from 3 cm to 68 cm. Four possible sources of this radiation are proposed and discussed quantitatively. It is concluded that the radiation does not originate in Jupiter's ionosphere, nor does it seem likely that it comes from its atmosphere. It is not due to synchrotron radiation by cosmic ray electrons. On the other hand, electrons from the sun which are trapped in

Jupiter's magnetic field may very well be the source. Observations for testing whether this possibility is correct are discussed. *Subject Headings:* **1. Radiation from Jupiter 2. Jupiter.**—*Author's abstract.* Ⓢ

4. MOON

11.9–91 551.521.6:551.593.5:523.3

Kozyrev, N. A., **Luminescence of the lunar surface and intensity of corpuscular radiation of the sun.** (Trans. of the original Russian in *Simferopol', Crimea. Krymskaia Astrofizicheskaia Observatoriia, Izvestiia*, 16(148), **1956.** 5 figs., 8 refs.) **DLC.** Trans. by F. Holden, issued by Laboratoire d'Astronomie de Lille (France) in *Astronomical News Letter*, Lille, France, No. 92:48–57, Feb. 20, **1959.** Mimeo. **DLC**—The author proves that the luminescence of the moon is due to corpuscular radiation from the sun. Spectrograms of different parts of the moon's surface in the autumn of 1955 were made at the Crimean Astrophysical Observatory and, when possible, the solar spectrum was taken for comparison. Study was made of the surfaces of the moon's maria, the mountainous part of the central portion of the moon, the bottoms of certain craters and Wood's spot. These investigations gave a negative result: the contours of the lines H and K proved to be identical with those of the solar spectrum. Only the crater Aristarchus, together with the adjacent Herodotus taken as an example of a ray system, showed a decidedly different contour for these lines. In the spectrum of Aristarchus the central part of the H and K lines looks narrower than in the solar spectrum. Results of spectrographic investigations of the ray system Aristarchus-Herodotus are discussed and shown in figures. Formulas are worked out to determine the energy of the radiation of the sun and are applied to the case of the maximum luminescence of the crater Aristarchus on Oct. 4, giving: $E=(A/nQ)\cdot 1.6\times 10^4$ ergs/cm^{-2}/sec^{-1} where E=energy of the radiation of the sun; A=reflecting capacity of the moon's surface; n=fraction of the area which is occupied by the bright luminescent substance on the visible surface of the crater; Q=coefficient of the energy output of luminescence. Hence the energy causing the luminescence is very considerable and is of the order of 1% of the solar constant ($S=1.32.10^3$). *Subject Headings:* **1. Corpuscular radiation from sun 2. Luminescence of the lunar surface 3. Crimean Astrophysical Observatory, U.S.S.R. I. Holden, F.** (*transl.*).—*A.V.*

11.9–92 523.32

Giamboni, Louis A. (*RAND Corp.*), **Lunar rays: their formation and age.** *Astrophysical Journal*, Chicago, 130(1):324–335, July **1959.** 9 figs., table, 6 refs., 8 eqs. **DWB, DLC**—The nature of the rays of Tycho and Copernicus suggests that they were laid down at a time when the angular velocity of the moon was markedly different from that observed today. The rays of Tycho indicate that the lunar sidereal period was between 0.5 and 6.8 days and that the poles were in approximately the same position then as they are today. These rays were created within 8×10^7 years of the time the moon was formed. The rays of Copernicus support these observations and indicate that the rotation of the moon at the time that these rays were formed was similar to the rotation which existed at the time that Tycho was formed. *Subject Heading:* **1. Lunar rays.**—*Author's abstract.* Ⓢ

11.9–93 523.32

†Mezger, P. G. and Strassl, H. (*both, Dept. of Radioastron., Bonn Univ., Observ.*), **The thermal radiation of the moon at 1420 Mc/s.** *Planetary and Space Science*, N. Y., 1(3):213–226, Aug. **1959.** 4 figs., 2 tables, 20 refs., 17 eqs. **DWB.** For German version, *see* **Die thermische Radiostrahlung des Mondes bei 1420 MHz.** *Zeitscrift für Astrophysik* 48(1):72–76, **1959.** fig., 10 refs., 5 eqs. **DLC** (QB1.Z4)—Measurements of the thermal radiation of the moon at 1420 Mc/s have been made with the continuum receiver of the 25 m radio telescope of Bonn University. The measurements cover about 3 lunations (30 April to 22 July 1958). The observations and their reduction are described in detail. It is found that—within the working accuracy of about ±2 per cent relatively—the radiation temperature of the moon at 1420 Mc/s shows no variation with the phase of the moon. This may be explained by the fact that the observed radiation has its origin at some depth underneath the moon's surface where the periodic variations of heating from the sun have become insignificant. The mean

value of the radiation temperature at 1420 Mc/s is found to be 250.2° with an estimated absolute uncertainty of about ±12 per cent. *Subject Headings:* **1. Thermal radiation of moon 2. Lunar temperatures.**—*Authors' abstract.* Ⓢ

11.9–94 523.34

Fremlin, J. H. (*Dept. Physics, Univ. Birmingham*), **Volcanoes on the moon.** *Nature*, London, 183(4656):239, Jan. 24, **1959. Comment** by J. C. Jaeger and **Reply** by Fremlin in *Ibid.*, 183(4671):1316–1318, May 9, **1959. DLC**—The article discusses why the origin of the moon's craters could be attributed to volcanic activity of the moon rather than that based on the meteoric theory. The effects of thermal conductivity of dust on the moon and the fact that the temperature of the hot rock in the moon had reached an equilibrium temperature point some time ago are discussed. The high temperature release of gases on the moon is caused by the low mechanical pressure of the dust. This encourages frequent small local instabilities that result in periodic liberation of puffs of hot gas and dust. *Subject Heading:* **1. Lunar craters.**—*N.N.* Ⓢ

11.9–95 523.34

Kozyrev, N. A., **Vulkanicheskaia deiatel'nost' na Lune.** [Volcanic activity on the moon.] *Priroda*, Moscow, 3:84–87, March **1959.** 2 figs. **DLC**—Proof of the existence of volcanic activity on the moon is presented by the author in his description of phenomena observed on the central peak of Alphonse Crater on Nov. 3–4, 1956 at the Crimean Astrophysical Observatory when a volcanic eruption was recorded. The recorded phenomenon was confirmed by the English observers P. WILKINS and F. BRION on Nov. 19, 1958, when they observed a reddish spot in the immediate vicinity of Peak Alphonse that did not exist before Nov. 1958. *Subject Headings:* **1. Lunar craters 2. Alphonse Crater.**—*A.M.P.* Ⓢ

11.9–96 523.346

Gaydon, A. G. and Learner, R. C. M. (*both, Imperial Coll. of Science and Technology, London*), **Simulation of lunar craters: a blow-hole theory.** *Nature*, London, 183(4653):37, Jan. 3, **1959.** 2 figs., 2 refs. **DLC**—Recent reports of volcanic activity on the moon have been investigated. The experiment described here shows that when a quantity of magnesium carbonate was evacuated rapidly from a flask, blow-holes were observed. A theory is advanced that when gas that has been trapped beneath the moon's loose "sandy" surface escapes, blow-hole craters are formed. This, unlike what happens on our earth, does not require any high surface temperature. *Subject Heading:* **1. Lunar craters.**—*N.N.* Ⓢ

11.9–97 523.36

Firsoff, V. A., **Is the moon covered with dust.** *British Astronomical Association, Journal*, 69(4):153–155, May **1959.** 6 refs. **DWB**—Gold's hypothesis is not valid nor is Garstang's support although it is instructive from the point of view of terrestrial conditions. The lunar dust surface basically rests on the numerical value of $(Kpc)^{\frac{1}{2}}$ where K is thermal conductivity, p density and c specific heat of the lunar surface material. Lunar pressure is far $<14\frac{3}{4}$ lb; gravity is 1/6 g. Dust depends on degree of compression for its thermal conductivity. *Subject Heading:* **1. Lunar dust.**—*W.N.* Ⓢ

11.9–98 523.36:523.164.34

Hédervári, Péter, **A hold légköréről.** [On the moon's atmosphere.] *Időjárás*, Budapest, 63(1):55–57, Jan./Feb. **1959. DLC**—Present knowledge on the moon's atmosphere is reviewed. The current figure accepted for the moon's atmospheric density is 5.10^{-13} times the terrestrial atmospheric density. This figure was obtained by ELSMORE at Cavendish Laboratory by means of radioastronomical measurement. The moon's atmosphere is believed to be composed of SO_2, O_3 and possibly rare gases. Volcanic eruptions are one of its possible sources. During the lunar night some of the atmosphere possibly is deposited at the moon's surface. The total mass of the lunar atmosphere is less than one millionth of the mass of the moon, a ratio similar to that of the earth's mass to that of its atmosphere. *Subject Heading:* **1. Lunar atmosphere.** —*G.T.* Ⓢ

5. METEORS

See also: **Meteor texts** (Astapovich), 11.9–5; **Radio echoes from meteor trails** (Greenhow, Neufeld), 11.9–286.

11.9–99 523.5

Cheng, Sin-I (*Princeton Univ., Aeronautical Eng. Dept.*), **On the mechanismus of atmospheric ablation.** *International Astronautical Congress, Amsterdam, Aug. 1958, Proceedings of the 9th Congress*, Vol. 1:252–264, issued **1959.** 8 figs., table, 14 refs., 10 eqs. English, German and French summaries. **DLC** (TL787.I44)—The problem of ablation of meteoric objects entering the atmosphere is considered. Existing theory of meteoric ablation due to LINDEMANN and DOBSON from the continuum point of view and that due to SPARROW and ÖPIK from the particle point of view, requires some modification. The deceleration of the meteorite and the presence of a molten layer over the meteoritic body results in an unstable liquid-gas interface that leads to the direct loss of mass as liquid droplets flying away from the meteoritic surface. The feasibility of this mechanism is analytically shown and demonstrated with typical examples. By incorporating the present mechanism, the irregularity of the meteoric luminosity when compared with the calculated results of Öpik's theory may be qualitatively explained and the occasional "burst" or "flare" of some meteors may be visualized. Several other observations of the meteoric phenomena also tend to verify the plausibleness of the proposed mechanism. *Subject Heading:* **1. Meteor ablation theories.**—*Author's abstract.*

11.9–100 523.5:535.33

Russell, John A. (*Dept. of Astronomy, Univ. of S. Calif.*), **A time-resolved spectrum of the terminal burst of a Perseid meteor.** *Astrophysical Journal*, Chicago, 131(1):34–37, Jan. **1960.** fig., table, 5 refs. **DWB, DLC**—A grating spectrum of the terminal burst of a Perseid meteor was obtained in 1956 that shows marked changes in the relative intensities of low-excitation and high-excitation iron lines in the course of the burst. The possible relationship of this phenomenon to that of the spectra of meteoric wakes is considered. The Perseid spectrum is compared with the spectrum of a sporadic meteor obtained on the same roll of film. *Subject Heading:* **1. Meteor spectra.**—*Author's abstract.*

11.9–101 523.5:621.396 523.164.85

Carpenter, Robert J. and Ochs, Gerard R., **The NBS meteor-burst communication system.** *U. S. National Bureau of Standards, NBS Report*, No. 6048, April 1, **1959.** 95 p. 52 figs. (incl. photos), 4 tables, 13 refs., eqs. **DWB**—This project was undertaken in 1955 to investigate the properties of the intermittent reception of VHF signals over long distances by meteoric propagation and their communications usefulness. To accomplish this, a complete duplex teletype system was constructed and results are here reported from tests made over a 1277 km east-west path. Comparisons were made of burst transmissions of 10, 20, 40, and 80 times 60 wpm teletype speed and of variations in a number of control system parameters. For the system under test, the optimum speedup was 40× which produced a daily average channel capacity of about 40 wpm with a character error rate of about 0.0035 (with the best control system settings). Higher speedup ratios are advocated for future systems. The most serious causes of outages in this type of system are atmospheric noise and sustained multipath distortion from competing modes such as Es and auroral propagation. *Subject Headings:* **1. Radio wave propagation by meteor ionization trails 2. VHF radio wave propagation.**—*Authors' abstract.*

11.9–102 523.164.85

Millman, P. M., (*Natl. Res. Council, Ottawa, Canada*), **Note on some observational characteristics of meteor radio echoes.** *Journal of Geophysical Research*, Wash., D. C., 64(12): 2192–2194, Dec. **1959.** 2 photos, 2 refs. **DLC**—Attention is called to the observational evidence for meteor echoes from portions of the path well removed from the position of minimum range. Fading periods for echoes observed at Ottawa are given. *Subject Heading:* **1. Radio echoes from meteor trails.**—*Author's abstract.*

11.9–103 551.556:551.590.25 523.164.85

Manning, L. A. (*Stanford Univ., Calif.*), **Air motions and the fading, diversity and aspect sensitivity of meteoric echoes.** *Journal of Geophysical Research*, Wash., D. C., 64(10):1415–1425, Oct. 1959. 9 figs., 13 refs., 6 eqs. **DLC**—A theory is presented which relates those properties of meteoric echoes that depend on distortion of the trail by winds. It is shown that existing results on the delay in the start of echo fading, the delay in echo appearance with aspect, the spectral composition of the received signal, and the regularity of the fading pattern are quantitatively explicable. In addition, the theory predicts that the ensemble-average rate of echo fading should rise characteristically with time and should then drop precipitously at the end of the ensemble echo; moreover, it predicts that the correlation of fading patterns at two ground receivers should be a gaussian function of the product of receiver spacing and echo fading cycle-number. Experimental results are given which confirm these predictions and make possible the determination of the principal properties of the wind profile. It is concluded that at the times of observation the small-scale cutoff wave length of the turbulence spectrum was about a kilometer, that lack of correlation of wind velocities existed in a vertical range of about a scale height, that the rms variable component of N-S wind velocity was about 50 m/s, and wind velocity was about 100. m/s. These figures agree with WHIPPLE's photographic studies of meteor trails. *Subject Headings:* **1. Radar observation of meteor echoes 2. Meteor trail distortion by wind.**—*Author's abstract.*

11.9–104 551.501.81:551.590.25

Manning, L. A. (*Stanford Univ., Stanford, Calif.*), **Oblique echoes from over-dense meteor trails.** *Journal of Atmospheric and Terrestrial Physics*, London, 14(1/2):82–93, April 1959. 9 figs., 8 refs., 21 eqs. **DLC**—Ray paths are computed for waves refracted by meteor trails having a Gaussian radial distribution of ionization density. From the spreading of initially parallel rays as they pass through the trail, a measure of reflected signal intensity vs. scattering angle is obtained; the results are presented in polar scattering diagrams, valid in the limit of large trail size. Equivalence theorems are derived relating both intensity and scattering angle for rays incident upon the trail at an arbitrary angle to the intensity and scattering angle for rays incident in the plane normal to the trail. Curves are presented showing the dependence of echo duration on forward-scatter-angle with trail orientation as parameter; it is found that the $\sec^2 \phi$ law developed for under-dense trails applies to over-dense trails only if the plane of propagation contains the trail axis. If not, the effective secant exponent may be as small as 0.3. The theory is compared with MCKINLEY and MCNAMARA's duration measurements. It is found that although the general agreement is satisfactory, the details of their experimental results depend on the way that winds change the trail orientation. The ray theory is also compared with KEITEL's wave theory solution. Unfortunately, he could not get wave solutions for dense trails of age greater than 0.357% of the minimum echo duration. Even so, the ray solutions agree with KEITEL's results for scatter angles up to 155°, thus including all angles available to ground-based stations. *Subject Headings:* **1. Radar echoes from meteor trails 2. Meteor trails.**—*Author's abstract.*

6. RADIO ASTRONOMY

11.9–105 523.164(08)

Waldmeier, Max (*Zurich*), **Fortschritte der Radioastronomie.** [Progress in radio astronomy.] *Naturwissenschaftliche Rundschau*, Stuttgart, 12(7):243–254, July 1959. 9 figs., 3 tables. **DWB, DLC**—The progress in radio astronomy, as presented at the symposium of the Astronomical Union and Radio Union held in Paris, July 30 to Aug. 6, 1958, is reported on under the subjects: moon, planets and comets, and especially on the sun. The radio emission of the calm sun, the radiation of coronal condensations, of R-areas, radiation eruptions, the radio astronomical exploration of the outer corona, and solar-terrestrial relations are dealt with. Technical problems are discussed under the following headings: structure of our stellar system, observations on radio sources, their optical identification, and hydrogen in galactic and extra-galactic star systems. Photographs of the 25 m radiotelescope of the Maryland Point Observatory, of the 15 m radiotelescope of the Naval Research Laboratories, Washington,

and of the expanding gas mist shell in Cygnus, taken by the 25 m Schmidt Refractor at Mt. Palomar, are among the illustrations. *Subject Heading:* **1. Progress in radio astronomy.**—*O.T.* Ⓢ

11.9–106 523.164:621.396.8

Giordmaine, J. A. and Alsop, L. E. (*both, Dept. Physics, Columbia Univ.*); Mayer, C. H. (*U. S. Naval Res. Lab., Wash., D. C.*) and Townes, C. H. (*Dept. physics, Col. Univ.*), **A maser amplifier for radio astronomy at *X*-band.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(6):1062–1069, June **1959.** 8 figs., 3 tables, 19 refs., 23 eqs. **DWB**—The design and operating characteristics of a maser radiometer for use in radio astronomy at 3 cm wavelength are discussed. The operating system which is described has a bandwidth of 5.5 mc and an input noise temperature, including background radiation into the antenna, of about 85°K. An rms fluctuation level of about 0.04°K is attained using an averaging time of 5 seconds. A discussion of the factors determining the sensitivity of such devices is presented. *Subject Headings:* **1. Maser radiometer 2. Radio astronomy instruments.**—*Authors' abstract.* Ⓢ

11.9–107 523.164:621.396.1:629.19

Marner, Gene R. (*Collins Radio Co.*), **Automatic radio-celestial navigation.** *Institute of Navigation, London, Journal*, 12(3/4):249–259, July/Oct. **1959.** 6 figs. (incl. photos), table, 13 refs., 5 eqs. **DWB, DLC**—Describes the features of the radio sextant and indicates the possibility of its use for automatic navigation. Two radio sextants are described and shown in photographs: 1) the experimental sextant completed in 1952 (Collins Radio Co.) presently in use aboard the U. S. S. "Arneb," and 2) a radio sextant (Marner and Willis, 1959) capable of tracking both the sun and moon with high precision. In the light of experiments with these instruments the entire problem of radio-celestial navigation is examined in minute detail. It is found that the use of the discrete sources of radio radiation does not appear practical with a small antenna due to the low flux density at microwave wave lengths and to competing atmospheric emission effects. However, the automatic radio sextant has demonstrated its capability for precise solar and lunar tracking in both clear and foul weather with an antenna of modest size. *Subject Headings:* **1. Radio sextants 2. Celestial navigation 3. Radio astronomy instruments.**—*I.S.* Ⓢ

11.9–108 551.510.536:621.396.1:523.164.3

MacArthur, J. W. (*Marlboro College, Marlboro, Vermont*), **Theory of the origin of the very low-frequency radio emissions from the earth's exosphere.** *Physical Review Letters*, N. Y., 2(12):491–492, June 15, **1959.** 2 refs., 7 eqs. **DWB, DLC**—A Doppler and proton-gyro concept is shown to be complementary rather than exclusive to (Gallet's) traveling-wave tube mechanism, hence work in progress may explain all types of dawn chorus by this combination process. *Subject Headings:* **1. Dawn chorus 2. Radio emissions from exosphere.**—*W.N.* Ⓢ

11.9–109 523.164.32

Bruzek, A. (*Fraunhofer Institut, Freiburg i. Br.*), **Die Radiowellenstrahlung der Sonne, I, cm- und dm Wellenlängenbereich.** [Radio wave radiation from the sun, Pt. 1, The cm- and dm wave length band.] *Umschau*, Frankfurt a.M., 59(20):620–622, Oct. **1959.** 2 figs. **DLC**—The wave length of the measurable radio wave radiation of the sun lies between the mm and meter region (10 to 15 m). This radiation consists of the following components, viz: (1) radiation of the resting undisturbed sun which varies only in the course of weeks and months; (2) a radiation slowly changing from day to day; (3) short lived bursts with durations ranging from tenths of seconds to ten minutes. Radio wave radiation with wave length up to 20 cm originate in the chromosphere, and those with wave lengths of 20–50 cm in the solar corona. The radiation source of the slowly altering wave component coincides in length, form and position with the calcium phase region. The region of greatest emission coincides with the brightest part of the flares. The radio emission regions move more quickly than the flares across the disk so that they are present above the chromospheric flare region at heights of 2000–100,000 km. At a 20 cm wave length the intensity corresponds to a temperature 600,000°. The radiation intensity as well as the size of the source diminishes on approach to the

edge of the sun so that emission occurs from a very thin layer approximately parallel to the solar surface. All these properties coincide with the bright corona region observed in the optical region. The slowly varying radio emission is hence a thermal emission from the bright corona region. A close correlation exists between 10 cm radiation and ionization of the E-layer of the ionosphere; this indicates that the ionizing X-ray radiation occurs in the same regions as the radio wave radiation. The burst radiation consists of three types, viz: (1) "the typical burst," a narrow intensity peak of 10 to 60 sec duration and a maximum value of 10^7 degrees; (2) the "post burst" lower intensity (10^6 degrees) which subsides monatomically and slowly in 20 to 60 sec, and (3) the "gradual rise and fall' with a slow steady rise and fall of intensity of about 10 minutes duration and a maximum value of 10^5 to 10^6 degrees. *Subject Heading:* **1. Solar radio radiation.**—*I.L.D.* Ⓢ

11.9–110 523.164.32

Bruzek, A. (*Fraunhofer Institut, Freiburg i. Br.*), **Die Radiowellenstrahlung der Sonne, I, Der m-Wellenlängenbereich.** [Radio wave radiation of the sun, Pt. 2, The meter wave region.] *Umschau*, Frankfurt a.M., 22(50):684–686, Nov. **1959.** 5 figs., 2 foot-refs., 8 refs. **DLC**—Studies of the long lived radio wave radiation have shown that the intensity of the "quiet" meter wave radiation and its distribution over the solar disk varies from day to day. In the meter region there exists also local centers of intensified quiet radiation. Its effective radiation of about 2×10^6 degrees indicates a thermal origin. The radio storms constitute another long level but restless radiation. The meter wave bursts consist of five types. Type I bursts have a life several tenths of a second to one second; a band width of 4 to 7 MHz and they do not change their frequency. The type III bursts have a similarly brief duration but at a band width of 10 MHz, they manifest a rapid frequency drift of about 20 MHz/sec. Type II bursts are powerful radiation outbursts with apparent temperatures of 10^{11} to 10^{14} degrees which often extend over the spectral region of 8.5 to 33 met. The type IV bursts consist of a rapid rise in radiation intensity with circularly polarized radiation following a type II burst. *Subject Heading:* **1. Solar radio radiation.**—*I.L.D.* Ⓢ

11.9–111 621.396.6:535.417:523.164.32

Goldstein, Samuel J., Jr. (*Harvard College Obs.*), **The angular size of short-lived solar radio disturbances.** *Astrophysical Journal*, Chicago, 130(2):393–399, Sept. **1959.** 4 figs., 2 tables, 7 refs., 3 eqs. **DWB, DLC**—A wide-band two-element adding interferometer which accepts simultaneously the radiation in the range 105–140 Mc/s was used to observe short-lived solar disturbances. The angular size of type I bursts was found to be less than 1.6 min. of arc. The average angular size of type III bursts in three clusters was 3.2 min., and for four other clusters an average lower limit of 3.3 min. was obtained. The theory of these measurements is explained. *Subject Heading:* **1. Solar radio disturbances.**—*Author's abstract.* Ⓢ

11.9–112 523.854.1:523.164.43

Voigt, H. H., **Die 21-cm-Linie: neue Möglichkeiten und Ergebnisse in der Astronomie, I, Beobachtungen innerhalb unserer Milchstrasse.** [The 21-cm line: new possibilities and results in astronomy, Pt. 1, Observations within our Galaxy.] *Umschau*, 59(15):452–455, Aug. **1959.** 3 figs. **Pt. 2, Beobachtungen an aussergalaktischen Objekten.** [Observations on outer galactic objects.] *Ibid.*, 59(16):494–496, Aug. 15, **1959.** photo, table, 6 refs. **DLC**—In this first review paper, the author discusses the physical characteristics of the 21-cm line, the celestial mechanics of our galactic system, the systematic analysis of the 21-cm line along the galactic plane and the demonstration of the spiral structure of galactic system; detailed structure of the spiral arms including hydrogen atmosphere and clouds, interaction between interstellar hydrogen and pleiades, etc; physics of interstellar matter; the Magellanic clouds including their radial velocities, the Andromeda cloud; cloud nebula and the red displacement. The second part of the article reports the details of observations such as the Magellanic and Andromeda clouds, the red-shift, etc. *Subject Headings:* **1. Radio astronomy 2. Galactic system** —*I.L.D.* Ⓢ

D. OUTER ATMOSPHERE

1. COSMIC RADIATION

See also: **Earth's radiation belt** (Singer), **11.9–144.**

11.9–113 551.521.6

Gherzi, E., **Note on the registration of cosmic rays intensity at Brebeuf College in Montreal.** *Bulletin de Géophysique*, Montreal, No. 4:19–23, Nov. **1958.** 2 figs., 3 refs. French summary p. 19. **DWB**—The author advances the feasibility of isocosmic lines and charts based upon a simplification of observations similar to what is practiced in rain observation with gages. The ionizing factor responsible for some recurring negative bays in the curren may well be due to the influence of radon. The variation observed to vary in accordance to declination of the sun remains an unsolved problem. *Subject Headings:* **1. Cosmic ray intensities 2. Montreal, Canada.**—*W.N.*

11.9–114 551.510.535:551.521.64:621.396.

Moler, William F. (*U. S. Navy Electronics Lab., Calif.*), **VLF propagation effects of a D-region layer produced by cosmic rays.** *Journal of Geophysical Research*, Wash., D. C., 65(5) 1459–1468, May **1960.** 7 figs., table, 17 refs., 11 eqs. **DLC**—The single-layered D-region model based only on Lyman a photoionization of nitric oxide is inadequate to explain certain aspects of VLF radio propagation. Empirical evidence indicates the existence of a second and lower D layer which is important for VLF propagation. It is shown that normal cosmic rays produce sufficient ionization for such a layer. The electron-production and -depletion processes effective below 100 km and the latitudinal distribution of cosmic ray primaries due to the geomagnetic field are discussed. A series of electron-density profiles obtained from photo ionization and cosmic ray ionization processes is compared with the two-layered D region model deduced from electromagnetic measurements. The calculated phase and amplitude characteristics of VLF signals reflected from the lower cosmic ray-induced layer during the presunrise hour are in good agreement with those measured. *Subject Headings:* **1. VLF radio wave propagation 2. D layer 3. Cosmic ray effects on ionosphere.**—*Author's abstract.* Ⓢ

11.9–115 551.521.64:523.74

Neher, H. V. (*Cal. Inst. of Tech., Pasadena*) and Forbush, S. E. (*Carnegie Inst. of Wash.*) **Correlation of cosmic-ray intensity and solar activity.** *Physical Review Letters*, N. Y., 1(5):173–174, Sept. 1, **1958.** fig., 4 refs. **DWB**—Evidence is produced to the effect that 1) the yearly averages of cosmic ray ionization at Huancayo correlate well with ionization at 90,000 ft at Thule, Greenland, and 2) there is a good anticorrelation with solar activity. These facts confirm that Zurich sunspot numbers are a good index of long term solar effect on world-wide cosmic ray intensity. Low energy particles are affected more than those of higher energy. *Subject Headings:* **1. Solar effects on cosmic rays 2. Cosmic ray intensities-solar relationships** —*G.T.*

11.9–116 551.521.64:546.29

†Shapiro, Maurice M. (*Nucleonics Div., U. S. Naval Res. Lab., Wash., D. C.*), **Heavy nuclei of primary cosmic radiation.** *New York Academy of Sciences, Transactions*, Ser. 2, 20(8):697–716, June **1958.** 5 figs., 3 tables, 42 refs. **DLC**—The most recent methods available for detecting and identifying the heavy nuclei of primary cosmic radiation are examined. A summary is made of some of the salient information on primary helium and on the primaries heavier than helium. The principal problems in the study of these nuclei and the feasibility of directly exploring primary cosmic radiation are also discussed. *Subject Heading:* **1. Primary cosmic rays.**—*N.N.*

11.9–117 551.510.5:551.521.64:519.241.

Trefall, Harald (*Univ. Bergen, Norway*) and Nordo, Jack (*Det Norske Met. Inst., Oslo*) **On systematic errors in the least squares regression analysis, with application to the at**

nospheric effects on the cosmic radiation. *Tellus*, Stockholm, 11(4):467–477, Nov. 1959. g., 5 tables, 13 refs., 36 eqs. **DLC**—It is shown that if the variables employed in a least quares regression analysis are subject to random errors of measurement, the expectation alues of the partial regression coefficients, of the partial correlation coefficients and of the nultiple correlation coefficient may all differ from those which would have existed, had no rrors been present. If there is no intercorrelation between the errors of different variables, andom errors in a given variable always reduce the numerical expectation values of the cor-esponding partial regression and correlation coefficients. Coefficients corresponding to other ariables may, however, be influenced in either direction depending on the intercorrelations etween the variables. The expectation value of the multiple correlation coefficient is reduced y errors in any variable. The general case, in which the errors of different variables are inter-orrelated, has also been briefly discussed. The problem of determining the atmospheric ffects on the cosmic radiation is then discussed. It is shown that some previously unexplained iscrepancies between empirical and theoretical estimates, and also between empirical estimates btained from the study of day-to-day variations, and such obtained from the seasonal varia-ions of the cosmic-ray intensity, are probably due to systematic effects of random errors in the erological data employed in the regression analysis. Estimates of error variances and co-ariances of aerological data from the upper troposphere and the lower stratosphere have been btained by analyzing differences between data from two closely situated stations on Spits-ergen. They have then been used to obtain corrected estimates of the cosmic ray atmospheric ffects, which are now found to agree fairly well with the theoretical ones. *Subject Headings:* **. Atmospheric effects on cosmic rays 2. Statistical analysis of cosmic ray atmospheric effects . Cosmic ray atmospheric effects.**—*Authors' abstract.* Ⓢ

2. IONOSPHERE

See also: **Ionosphere**, 11.9-18; **Cosmic ray effects on ionosphere** (Moler), 11.9–114; **Ionos. radio wave refraction** (Mechtly), 11.9–245.

11.9–118 551.510.535:551.594.12:546.21

Inoue, Yuji (*Tech. Res. Inst., Natl. Defense Agency, Tokyo*), **On the importance of the esonance-lines of atomic oxygen to the ionospheric ionization.** *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):85–88, Sept. **1959.** eqs. **DLC**—A new interpretation f the effective recombination coefficients of an electron in the ionosphere is advocated. A new heory for the ionization mechanism in the ionosphere is also brought forward. The resonance nes of atomic oxygen are of 1302–1306 A, $3s^3S^\circ - 2p^3P$, and 1025.7 A, $3d^3D^\circ - 2p^3P$. These nes were observed at 115 km as a strong emission. The new theories of the ionosphere are iscussed, relating to the interpretation of the formation of these emission lines in the iono-phere. *Subject Headings:* **1. Ionospheric ionization 2. Atomic oxygen.**—*Author's abstract.* Ⓢ

11.9–119 551.510.535:551.594.13

Kamiyama, Hiroshi (*Geophys. Inst., Tohoku Univ.*), **Remarks on the electrical con-uctivity of the ionosphere.** *Tohoku Univ., Science Reports, 5th Ser., Geophysics*, 11(2):73–83, Sept. **1959.** 10 figs., 4 refs., 2 eqs. **DWB, DLC**—In a previous paper on ionospheric con-uctivity, it is assumed that the ratio of the concentration of negative ions to that of electrons aries only with height. Considering the equilibrium between electrons and negative ions, he ratio is given by a function of the electron concentration as well as height. The results iven in the previous paper are remarkably affected by the high value of this ratio, especially n the night hours. The numerical results are shown as the functions of the electron concentra-ion in the figures. *Subject Headings:* **1. Ionospheric conductivity 2. Electrical conductivity n ionosphere.**—*Author's abstract.* Ⓢ

11.9–120 551.510.535:551.594.12

Kamiyama, Hiroshi (*Geophys. Inst., Tohoku Univ.*), **A study of the formation of the onospheric layers.** *Tohoku Univ., Science Reports, 5th Ser., Geophysics*, 11(2):98–112, Sept. 959. 8 figs., 2 tables, 35 refs., 31 eqs. **DWB, DLC** The various processes of photoionization

are examined on the basis of the rocket data of the solar emissions and the atmospheric constituents. The ionization of the E layer is mainly due to soft X-rays and to the Lyman beta component. After discussing the concentration of positive ions of molecular oxygen and its significance to the effective recombination coefficient, it is concluded that the whole F region is produced by photoionization by coronal emissions. *Subject Headings:* **1. Ionospheric layer formation 2. Photoionization.**—*Author's abstract.* Ⓢ

11.9–121 551.510.535:551.594.12

Martyn, D. F. (*Indust. Res. Organ., Camden, N. S. W.*), **Sporadic E-region ionization 'Spread F,' and the twinkling of radio stars.** *Nature*, London, 183(4672):1382–1383, May 16 **1959.** fig., 6 refs., 2 eqs. **DWB**—An explanation of these phenomena is given. It is shown how the kinematically unstable surface ionization of the upward drifting F region and the simultaneous down-drift (or rather lag) of small irregularities become capable of producing the pronounced scattering responsible for scintillation and "spread F." In the E region a cylindrical perturbation with travel through the medium as a wave which is almost certain to be accountable for the equatorial sporadic E region ionization. It is the kinematic instability in the ionization gradient of a medium drifting across a magnetic field which basically governs the above phenomena. *Subject Headings:* **1. Sporadic E (Es) layer ionization 2. Spread F 3. Radio star scintillation.**—*W.N.* Ⓢ

11.9–122 551.510.535:551.594.13

Shanack, S. (*Univ. of Maryland*), **A theoretical current density ansatz for the quiet day solar semi-diurnal tidal mode of oscillation of the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(4):337–344, Feb. **1960.** 6 refs., 16 eqs. **DLC**—A theoretical current density ansatz incorporating the atmospheric tidal resonance theory of PEKERIS into the steady-state form of the "generalized Ohm's law," based on a number of simplifying physical assumptions, is obtained. The result is an embodiment of a generalized atmospheric dynamo mechanism of the origin of the upper atmospheric current systems. The horizontal (co-latitudinal and longitudinal) components of this current density are numerically integrated over an ionized spherical shell concentric with the earth, resulting in approximate expressions for the current density. Various applications of these approximate expressions are mentioned. *Subject Headings:* **1. Ionospheric oscillations 2. Solar semidiurnal tides 3. Dynamo theory of ionosphere.**—*Author's abstract.* Ⓢ

11.9–123 551.510.535:551.594.12:550.385.25/6

Shaw, J. E. (*Ionospheric Prediction Service, Dept. of the Interior, Miller's Point, Sydney, N. S. W.*), **Geomagnetic and current control of E-region absorption.** *Planetary and Space Science*, N. Y., 2(1):1–9, Oct. **1959.** 4 figs., 2 tables, 17 refs., 5 eqs. **DWB**—Seasonal variations of ionospheric absorption are studied from the mid-day routine tabulations of the parameter $f_{\min}$, from 18 ionospheric stations. A quantity, $B = f_{\min} : foE$, is defined and its variations in both geographic and geomagnetic latitudes are studied. It is shown that the value of B varies about a steady value, the amplitude and sense of the variation being related to the intensity of the current in the S_q current system and the latitude of the station. A lunar semidiurnal variation in the quantity B is found for Kihei. The ratio of the solar and lunar variations in B is found to compare favorably with the ratio of the total currents in the S_q and lunar current systems. A recent model of the E layer is used to define the upper and lower limits of the absorbing region, and it is concluded that the absorbing region occupies the whole of the dynamo current region below the reflection height of the exploring waves. The control of the absorption process is related to the vertical drift of neutral ionization resulting from east-west current flow. A mechanism is proposed in which the scale size of scattering irregularities in the E layer is changed by the direction and velocity of the vertical drift of ionization. A number of observed absorption effects are discussed and it is shown that the theory describes the qualitative behavior observed in these effects. Reference is made to the likely importance of the process of control of absorption in the auroral zones. *Subject Headings:* **1. Ionospheric absorption variation 2. E region absorption 3. Geomagnetic effects on ionization 4. Geomagnetic Sq field.**—*Author's abstract.* Ⓢ

11.9–124 551.510.535:551.594.13:551.594.5:550.388.2

Shaw, J. E. (*Ionospheric Prediction Service, Dept. of the Interior, Miller's Point, Sydney*), **A theory of the origin and geomagnetic control of two types of high latitude Es.** *Planetary and Space Science*, N. Y., 2(1):56–59, Oct. 1959. 2 figs., 8 refs. **DWB**—Observations of nighttime Es occurrence from four stations near the southern auroral zone are analyzed. A major peak in the diurnal curves for the percentage hourly occurrence of *f* type Es is identified with the peak of occurrence of Auroral Belt type Es discussed by PENNDORF and CORONITI for the northern auroral zone. It is found that the probable low latitude extent of this peak is approximately 50° geomagnetic. A theory is proposed which attributes the occurrence of Auroral Belt type Es and Thule type Es to two separate processes, both of which involve the entry of electrons into the ionosphere under the control of the geomagnetic field. The theory shows that Auroral Belt type Es may be caused by electrons from a region of trapped particles the extent of which can be defined by the extent in geomagnetic latitude of the nighttime peak in *f* type Es occurrence. Thule type Es may be caused by an influx of electrons into the ionosphere from a stream of particles approaching from the direction of the sun. The deflections of the peak of occurrence of *f* type Es from the midnight magnetic meridian, and of the Thule type Es from the "geomagnetic noon" meridian, are a function of the mean energy of the electrons and the curvature and intensity of the lines of force in the geomagnetic field. *Subject Headings:* **1. Nighttime sporadic E layer (Es) 2. Geomagnetic effects on sporadic E layer (Es).**—*Author's abstract.*

3. AURORAS

See also: **Auroral res.** (Krasovskiĭ), 11.9–20; **Sporadic E(Es) layer formation** (Shaw), 11.9–124; **Radio noise bursts associated with auroras** (Ellis), 11.9–134; **Auroral effects on geomag. field** (Vestine, Sibley), 11.9–141; **Auroral zone disturbances** (Arkhangel'skiĭ, Sukhotskiĭ), 11.9–239; **Auroral zone disturbances** (Elvey, Sugiura), 11.9–240.

11.9–125 551.501.81:551.594.5

Harang, L. and Tröim, J. (*both, Div. Telecommunications, Kjeller, Lillestrøm, Norway*), **Determination of the angle of arrival of auroral echoes.** *Journal of Atmospheric and Terrestrial Physics*, London, 14(1/2):107–110, April 1959. 3 figs., 5 refs. **DLC**—The angle of arrival, θ, of auroral echoes is measured by an interference method. The variation of θ with echo range R is demonstrated. θ varies from 15° to 6.5° when the range increases from 400 to 730 km. The height of the reflection area must lie at 100–120 km. *Subject Headings:* **1. Angle of arrival of auroral echoes 2. Interference method.**—*Authors' abstract.* Ⓢ

11.9–126 551.506.22:551.594.5(99)

†Hatherton, T. and Midwinter, G. G. (*both, Dept. of Sci. & Industrial Res., Wellington, N. Zealand*), **Observations of the aurora australis at New Zealand Antarctic stations during IGY.** *Journal of Geophysical Research*, Wash., D. C., 65(5):1401–1411, May 1960. 11 figs., 4 tables, 21 refs. **DLC**—Intensive auroral observations at Scott Base and Hallett Station during IGY indicate that auroral activity is higher than has previously been estimated at these latitudes. The distribution of auroral activity is not simple; it appears to consist of two superimposed axes. Orientation of the principal arcs fits a zone which takes account of the nondipole field better than one based on the centered geomagnetic dipole, though the auroral frequencies conflict with this. Auroral activity increases with local geomagnetic disturbance at Hallett Station, but at Scott Base there is negligible increase in the probability of auroral occurrence until $K = 5$. However, the diurnal variation of auroral frequency which is bimodal with the primary maximum at 04 hours local time and the secondary maximum at 17 hours local time, does not appear to be related to the diurnal trend of local geomagnetic disturbance, but the principal auroral events inside the zone seem to coincide with the principal magnetic events in the Stagg transition zone. The only characteristic colored form observed, a pale red glow on the horizon, is associated with high magnetic activity and ionospheric absorption. The latitude of auroral forms decreases with increase in K index. The results are compared with those of previous expeditions to Ross Island and Cape Adare. *Subject Headings:* **1. Aurora australis 2. IGY auroral program 3. Auroral frequencies 4. Antarctica.**—*Authors' abstract.* Ⓢ

11.9–127 551.521.326 551.594.5

Krasovskiĭ, V. I.; Galperin, G. I.; Mironov, A. V. et al., (*Inst. for Atmospheric Physics, Academy of the U.S.S.R., Moscow*), **Results from studies of the night airglow and aurorae in the U.S.S.R.** *Annales de Géophysique*, Paris, 14(3):356–367, July/Sept. **1958.** figs., tables, 2 refs. **DLC**—The equipment used at the Institute for Atmospheric Physics of the Academy of Sciences of the U.S.S.R. is described. Results concerning auroral spectra and night airglow are covered in: 1. A review of observational results (Krassovskiĭ, V. I.). The equipment used at the Institute for Atmospheric Physics of the Academy of Sciences of the U.S.S.R.; some results obtained at the Institute (hydroxyl radiation, emissions of molecular oxygen, emission of sodium, auroral spectra, observations of auroras with wide angle all-sky cameras, radar echoes from auroras). 2. Hydrogen emission in auroras (Galperin, G. I.). 3. Some results of investigations of night airglow and auroras (Mironov, A. V., Prokudina, V. S. and Shefov, N. N.). 4. Hydroxyl emission from observations at Burokan (Armenia) (Fedorova, N. I.). 5. Relative intensity of N_2 and N_2^+ bands in the infrared part of auroral spectra obtained near Murmansk (Bagariatskiĭ, B. Y.). *Subject Headings:* **1. Night airglow 2. Auroras 3. U.S.S.R. I. Prokudina, V. S. II. Shefov, N. N. III. Fedorova, N. I. IV. Bagariatskiĭ, B. A.**—*A.V.*

11.9–128 523.75:551.521.67:551.594.5

Osterbrock, Donald E. (*Washburn Obs., U. of Wisc.*), **Proton flux during the great aurora of Sept. 3–4, 1959.** *Science*, Wash., D. C., 131(3397):353–354, Feb. 5, **1960.** 8 refs. **DLC**—Photoelectric measurements of the $H\alpha$ intensity show that it continued to increase after a corona formed, and reached a maximum as the corona broke up into rays, decreasing rapidly to nearly zero within the next 10 min. The maximum flux of protons incident on the earth during the aurora, deduced from these measures, was at least 1.4×10^8 auroral protons per square centimeter, per second. *Subject Headings:* **1. Aurora of Sept. 3–4, 1959 2. Solar proton flux 3. Auroral effects on corpuscular radiation.**—*Author's abstract.* Ⓢ

11.9–129 551.508.9:551.594.51:535:33

Clark, K. C. and Romick, G. J. (*both, Alaska Univ.*), **An auroral spectrograph.** *Optical Society of America, Journal*, 49(2):141–145, Feb. **1959.** 4 figs. (incl. photos), 2 tables, 4 refs., 15 eqs. **DWB, DLC**—High sensitivity to auroral $H\alpha$, resolution in elevation angle along a narrow band from horizon to horizon, and simplicity of components are principal features of a new automatic auroral spectrograph. Sky light reaches an all-sky convex mirror by way of an external curved slot in the vertical plane, whose calculated shape gives a flat image of uniform width. This slit image of adjustable width is photographed from above by a standard 16-mm camera with $f/0.95$ lens, the light having passed through a blazed grating at minimum deviation. In this arrangement distortions in the noncollimated beam and losses by reflection are kept low, and slit adjustment to 25-A resolution enhances detection of the broadened $H\alpha$ emission line. Satisfactory sensitivity to major airglow lines, hydrogen, and auroral features is obtained in successive 15-min. exposures, representing an approximately fivefold improvement in time resolution over that of the IGY patrol spectrograph, with a consequent loss in spectral resolution. *Subject Heading:* **1. Auroral spectrographs.**—*Authors' abstract.* Ⓢ

11.9–130 551.594.51:535.33

*†Dieke, G. H. and Heath, D. F., **The first and second positive bands of N_2.** Johns Hopkins Univ. Dept. of Physics, Contract AF(30.1)-1447 and Contract AF 19(604)-5516, Spectroscopic Report, No. 17, Dec. **1959.** 185 p. 10 figs., numerous tables, 30 refs., numerous eqs. —The first and second positive groups of N_2 have been photographed with a low pressure discharge cooled with liquid nitrogen and better resolution achieved than in previous work. The rotational analysis of 21 bands of the first and 9 of the second positive group has yielded the energy levels of $A^3\Sigma$ to $v=12$, of $B^3\Pi$ to $v=18$ and of $C^3\Pi$ to $v=4$ to within about 0.01 cm^{-1} relative to each other and to within about 1 cm^{-1} with respect to the normal state of the molecule. With these levels the lines in all other bands can be calculated to within the limits of experimental errors. In the second positive group a number of weak satellite branches were found that have not been observed before. Exposures at higher temperatures and an afterglow

in argon have yielded more information about the perturbations of the $C^3\Pi$ state. The anomalous intensities in these perturbations have been interpreted as abnormal occupation of the upper states rather than abnormal transition probabilities. The deviations from thermal equilibrium promise interesting information about the excitation mechanism of the second positive group. *Subject Headings:* **1. Auroral nitrogen bands 2. Auroral spectra.**—*Authors' abstract.* Ⓢ

11.9–131 523.75:551.594.51

McPherson, D. H. (*Queen's Univ. of Belfast, Ireland*) and Jones, A. Vallance (*Univ. Saskatchewan, Canada*), **A study of the latitude dependence of OH rotational temperatures for Canadian stations.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(4):302–308, Feb. **1960.** fig., 4 tables, 13 refs. **DLC**—Spectra of the 6,2 and 5,1 OH rotation-vibration bands have been obtained at Saskatoon, Churchill and Resolute Bay over the period of 1957–1958. Rotational temperatures have been derived from the spectra. The mean temperatures obtained at the stations were: Resolute Bay (Feb.–March, 1957) 296°K, Saskatoon (Feb.–March, 1957) 264°K, Churchill (March, 1958) 246°K and Saskatoon (April–May, 1958) 227°K. The results were consistent with the latitude effect detected by CHAMBERLAIN and OLIVER (1953). There appears to be a significant but unexplained difference between the 1957 and 1958 Saskatoon results. *Subject Headings:* **1. Rotational temperatures of auroras 2. Saskatoon, Saskatchewan.**—*Authors' abstract.* Ⓢ

4. GEOMAGNETISM

See also: **Gravitational stability presence of a magnetic field** (Chandrasekhar, Fermi), 11.9–67; **Electro-hydromagnetic waves** (Cole), 11.9-68; **Electro-hydromagnetic waves** (Williams), 11.9–69; **Geomag. effects on ionization** (Shaw), 11.9-123; **Geomag. effects on sporadic E layer (Es)** (Shaw), 11.9-124; **Satellite-magnetic field relationships** (Zonov), 11.9–152; **Magneto-ionic soundings** (Scholte), 11.9-243; **Mag. field effects** (Holter), 11.9–244; **Computer program for magneto-ionic tables** (Mechtoly), 11.9–245.

11.9–132 550.385.37

Veldkamp, J. (*Royal Netherlands Met. Inst., De Bilt*), **A giant geomagnetic pulsation.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(4):320–324, Feb. **1960.** 2 figs., table, 14 refs. **DLC**—A giant geomagnetic pulsation, which occurred on July 17, 1958, was recorded by many European observatories between 50° and 60° geomag. lat. The movements (with periods of about 100 sec) are coherent in only a small part of the area in which they are recorded. The greatest amplitudes (25 γ) are found in a strip following the circles of geomag. lat. Comparisons are made with theories of OBAYASHI and JACOBS, and SCHOLTE. *Subject Heading:* **1. Geomagnetic pulsations.**—*Author's abstract.* Ⓢ

11.9–133 550.385.4:538.69:532.59

†Dessler, A. J. (*Lockheed Aircraft Corp., Palo Alto, Calif.*) and Parker, E. N. (*Enrico Fermi Inst. for Nuclear Studies, Univ. of Chicago*), **Hydromagnetic theory of geomagnetic storms.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2239–2252, Dec. **1959.** 5 figs., 30 refs., 30 eqs. **DLC**—A hydromagnetic theory is presented which explains the average characteristics of geomagnetic storms. The magnetic storm is caused by a sudden increase in the intensity of the solar wind. Stresses are then set up in the geomagnetic field by the solar plasma impinging upon the geomagnetic field and becoming trapped in it. These stresses, which are propagated to the earth as hydromagnetic waves, account for the observed average magnetic storm variations. The sudden commencement of the magnetic storm is due to a hydromagnetic wave generated by the impact of the solar plasma on the geomagnetic field. The initial phase of the magnetic storm, during which the magnetic field is above average intensity, is due to the increased solar wind pressure. During the initial phase, instability causes small plasma clouds to become imbedded in the magnetic field. They break up and diffuse into the magnetic field to form a belt of trapped particles from the sun (principally protons and electrons). The trapped protons set up stresses, mainly due to centrifugal force, which account for the main phase of the magnetic storm. The recovery from the main phase is

attributed to the relief of the stress on the geomagnetic field by the transfer of the energy of the trapped protons to neutral hydrogen by means of ion-atom charge exchange. The correct recovery time for the magnetic storm is predicted from the measured cross section of the ion-atom charge-exchange process and the hydrogen density values around the earth deduced from the scattering of solar Lyman-α radiation. *Subject Headings:* **1. Hydromagnetic theory of geomagnetic storms 2. Geomagnetic theories.**—*Authors' abstract.* Ⓢ

11.9–134 551.594.5:550.385.4:621.396.8

Ellis, G. R. A. (*Upper Atmosphere Section, CSIRO, Camden, N. S. W.*), **Low frequency electromagnetic radiation associated with magnetic disturbances.** *Planetary and Space Science*, N. Y., 1(4):253–258, Sept. **1959.** 5 figs., 2 tables, 13 refs., eqs. **DWB, DLC**—Continuous observations of the amplitude and spectrum of naturally occurring radiation in the band 2–40 kc/s were made during the period June to December 1958 near Sydney, Australia. A large number of isolated noise bursts lasting for some hours were detected. The intensity ranged from 6×10^{-19} to 6×10^{-17} W m^{-2} (c/s)$^{-1}$ at 4.6 kc/s. Three main types of bursts were identified and classified on a basis of their spectra which usually extended from 3 to 5 kc/s and 2 to 30 kc/s, respectively. Major bursts, which were always of the latter two types, were clearly associated with strong auroral and magnetic activity and some showed a reproducible sequence of amplitude variation lasting about 36 hrs. On three occasions, a detailed correspondence between the intensity of the noise and of simultaneously occurring red oxygen airglow was observed. Theories of the origin of the noise are discussed. *Subject Headings:* **1. Radio noise bursts 2. Magnetic disturbances.**—*Author's abstracts.* Ⓢ

11.9–135 550.385.4(09)

†Vestine, E. H., **Magnetic storms.** *Science*, Wash., D. C., 130(3380):897–901, Oct. 9, **1959.** 3 figs., 27 refs. **DLC**—The author has briefly reviewed the history of the study of magnetic storms dating back to 1741 when HORTER discovered that the magnetic field undergoes occasional changes in intensity on nights of aurora. He analyzes various data on electric current systems in the ionosphere and gives reasons for the sudden commencements of storms and the associated changes and pulsations based on the propagation of shock waves. He suggests replacing the various rather vague theories about magnetic storms now currently studied with the more meaningful ones that will explain the results of the observations of the effects due to meteors, cosmic dust and gases, X-rays and radio waves and the polar aurora. *Subject Headings:* **1. Magnetic storms 2. Magnetic storm theories.**—*N.N.* Ⓢ

11.9–136 550.385.41

†Piddington, J. H. (*Radiophysics Lab., Sydney, Australia*), **Geomagnetic storm theory.** *Journal of Geophysical Research*, Wash., D. C., 65(1):93–106, Jan. **1960.** 3 figs., table, 26 refs., 10 eqs. **DWB, DLC**—A discussion of the two-gas theory of the transmission of geomagnetic disturbances through the atmosphere (to several earth radii) is extended, with the following results: (i) The central problem concerning the main phase of a geomagnetic storm is the mechanism of penetration of solar ions into the geomagnetic field. An explanation is given depending on a combination of a uniform electric space-charge field and a system of irregular fields. (ii) A model of the main phase of a geomagnetic storm is given, the principal feature of which is a "magnetic tail" extending from the earth on the dark side. (iii) The model may help to explain some other effects: the Gegenschein, electrons with auroral energies, the location of the Van Allen zones, and diurnal cosmic-ray variations. (iv) All observed geomagnetic disturbances have their sources initially in current systems in the lower ionosphere. Some are subsequently maintained by current systems in the earth itself and in the region of interaction between the solar and terrestrial plasmas. Others, mainly polar and equatorial, are maintained by ionospheric currents driven by space-charge electric fields. (v) Any ring current outside the geomagnetic field could cause an increase in the horizontal component. A westward-flowing ring current embedded in the field could cause either an increase or a decrease in the horizontal component. The basic effect is not the current but a sustained inward or outward mechanical force on the material in which the current flows. *Subject Headings:* **1. Geomagnetic storm theories 2. Two-gas theory of magnetic storms.**—*Author's abstract.* Ⓢ

11.9–137 551.506.22:550.385.43(73)

*†Matsushita, S. (*Univ. of Colorado*), **Studies on sudden commencements of geomagnetic storms using IGY data from United States stations.** *Journal of Geophysical Research*, Wash., D. C., 65(5):1423–1435, May **1960.** 9 figs., 2 tables, 39 refs. **DLC**—This report contains studies of geomagnetic storm variations recorded at a network of seven IGY stations in the U. S. together with records for other observatories operated by the U. S. The distance between adjacent stations of the network ranges from 360 to 510 km. Geomagnetic variations at these stations were usually quite similar, as would be expected. During magnetic storms, however, remarkable differences occurred even between adjacent stations. About half of the sudden commencements of the horizontal component showed different shapes at adjacent stations for the same magnetic storm. From the data obtained from these results, and from observations at more distant stations, the behavior of sudden commencements is examined. The data also show that the variations of the vertical component of the sudden commencement differ in ways suggesting notable irregularities of the earth's conductivity in the central part of the United States. In addition, occasional examples of bay-shaped variations during magnetic storms, which are quite nonuniform over the closely spaced net, are illustrated and analyzed. *Subject Headings:* **1. Sudden commencements 2. IGY geomagnetic program 3. United States.**—*Author's abstract.* Ⓢ

11.9–138 550.385.43

*†Williams, V. L. (*Goddard Space Flight Center, Natl. Aero. & Space Admin., Wash., D. C.*), **The simultaneity of sudden commencements of magnetic storms.** *Journal of Geophysical Research*, Wash., D. C., 65(1):85–92, Jan. **1960.** 15 figs., 6 tables, 19 refs. **DWB, DLC**—Rapid-run magnetograms from the U. S. Coast and Geodetic Survey (USC & GS) and from other observatories located near the magnetic equator were used to study sudden commencements that occurred during the period Oct. 1957 to Sept. 1958. Analysis of these magnetograms yielded three important results: (1) the sudden commencement always occurred first in high or middle latitudes; (2) Little America, Antarctica, registered the sudden commencement first or second 85% of the time; and (3) the apparent propagation velocities of the sudden commencement around the magnetic equator had average values between 1145 and 2835 km/sec. *Subject Heading:* **1. Sudden commencements.**—*Author's abstract.* Ⓢ

11.9–139 550.386

Shapiro, Ralph and Ward, Frederick W., Jr. (*both, GRD, AF Camb. Res. Center, Mass.*), **Daily normals of the international magnetic character figure C_i.** *Journal of Geophysical Research*, Wash., D. C., 65(1):115–117, Jan. **1960.** fig., table, 4 refs. **DWB, DLC** –Daily normals (averages) of C_i have been computed for each day of the year using the "final" C_i figures for the 72-year period 1884–1955. The significance of departures of the daily averages from a smoother continuum is discussed. The observed departures can be attributed to random sampling fluctuations. *Subject Heading:* **1. Magnetic character figures.**—*Authors' abstract.* Ⓢ

11.9–140 550.386.6(63)

*Gouin, Pierre, **Magnetic activity at Addis Ababa, July–Dec. 1958.** *Addis Ababa, Ethiopia. University College. Geophysical Observatory, Bulletin*, 1(2):103–132, July **1959.** Almost entirely figs. and tables. Summaries in Ethiopic and English p. 103.—The methods and techniques used in the preparation of this report are essentially the same as described in the first report (*Bulletin*, No. 1, Vol. 1); if alterations are to be introduced either in the presentation of the data, or even in the methods, this will not be done before January 1959 in order to leave the whole year 1958 a unit in itself. The only additions in this report are (a) the values of the hourly means for the international Q and D days at the end of the tables of their respective components, and (b), the means of the night hours, in the Appendix. *Subject Headings:* **1. Magnetic data 2. Addis Ababa, Ethiopia.**—*Author's abstract.* Ⓢ

11.9–141 550.388.2:551.594.5:681.14:621.38

Vestine, E. H. and Sibley, W. L. (*both, Rand Corp., Santa Monica, Calif.*), **Lines of force of the geomagnetic field in space.** *Planetary and Space Science*, N. Y., 1(4):285–290, Sept. **1959.** 2 figs., table, 12 refs., 8 eqs. **DWB, DLC**—The lines of force of the geomagnetic field

at various latitudes and longitudes in the Northern Hemisphere are approximately traced to their intersections with the earth's surface in the Southern Hemisphere, using an electronic computer and the first nine Gauss coefficients. Those lines leaving the average northern auroral zone are traced to their intersection of the geomagnetic field with the earth's surface. These points of intersection are found to be very nearly at the average southern auroral zone deduced from auroral observations and from magnetic measurements of disturbance. It is concluded, therefore, that the geomagnetic field has stability and a simple character even at distances as great as about 6 earth radii above the earth, measured in the equatorial plane, even during auroral displays. It is also concluded that solar streams at such time do not seriously distort the field lines connecting the auroral zones. *Subject Headings:* **1. Geomagnetic field stability 2. Auroral effects on geomagnetic field.**—*Authors' abstract.* Ⓢ

11.9–142 550.389 550.385.26:523.75

Onwumechilli, C. A., (*University College, Ibadan, Nigeria*), **Fluctuations in the geomagnetic horizontal field near the magnetic equator.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(4):286–294, Feb. **1960.** 4 figs., 2 tables, 9 refs., eq. **DLC**—Six-hundred fluctuations in the geomagnetic horizontal component (*H*) and vertical component (*Z*) have been measured from the magnetograms taken at Ibadan in April and May 1958. An analysis of these has shown that: (a) the frequency of occurrence varies with local time in the same way as S_q; (b) the amplitude of fluctuations increases in a general way with S_q; (c) the amplitude of fluctuations in both *H* and *Z* tend to increase linearly with period in duration (T) and there is some evidence for a change of slopes at about $T=33$ min with the fluctuations of longer duration increasing more slowly with T than those of shorter duration; (d) fluctuations under quiet conditions occur mostly during daytime and are more frequent when S_q is high; (e) fluctuations during the night are of long duration and mostly occur during disturbance ($K_q>3+$). It has been shown that fluctuations under quiet conditions have the characteristics of solar flare effects and it is therefore suggested that both arise from similar causes. *Subject Headings:* **1. Geomagnetic field components 2. Geomagnetic field fluctuations.**—*Author's abstract.* Ⓢ

5. ZODIACAL LIGHT AND VAN ALLEN BELT

11.9–143 551.590.25:523.59

Fesenkov, V. G., **Novoe v izuchenii mezhzvezdnoĭ i mezhplanetnoĭ sredy.** [Recent developments in the study of interstellar and interplanetary medium.] *Priroda*, Moscow, 2:4–7, Feb. **1959.** fig., 5 refs. **DLC**—In connection with the IGY the Academy of Science of the U.S.S.R. sent an expedition to southern Egypt to study the zodiacal light and the optical properties of the atmosphere associated with those layers where the presence of fine meteoric dust is to be expected. The results of investigations indicate that the zodiacal light is distinguished by a continuous spectrum. The usual emission lines of the night sky are not intensified in it. Its color does not differ from that of the sun. The extensive polarization of the zodiacal light is explained by the optical properties of the fine cosmic dust characteristic of the upper atmospheric layers; there is no need to attribute any scattering to free electrons. Isophotes of zodiacal light taken in the tropics are narrower than those obtained in the central Asiatic deserts, there the ecliptic is considerably inclined to the horizon so that the zodiacal illumination is dispersed by the troposphere. The origin of zodiacal light may be explained by the fact that interplanetary space is continually being filled not only as the result of the disintegration of asteroids but also of periodic comets and that together they fall on the sun but are swept out from the solar system by the pressure of solar radiation. The characteristics of interplanetary space differ from those of interstellar space. The interplanetary dust has a secondary origin and indirectly indicates the existence of asteroid- and comet-like bodies. It is possible that the diffuse cloudiness with continuous spectra indicates the presence of analogous bodies in cosmic space. The article contains a discussion of the origin and structure of the gaseous and dust cloudiness of interstellar space, the stellar chain in the constellation of Cassiopeia, the interaction between stars and cloudiness in the present epoch in the life of our galactic system, etc. *Subject Headings:* **1. Zodiacal light 2. Interplanetary dust 3. Interstellar dust.**—*I.L.D.* Ⓢ

11.9–144 551.521.64

Singer, S. Fred (*Dept. of Physics, Maryland Univ.*), **Cause of the minimum in the earth's radiation belt.** *Physical Review Letters*, N. Y., 3(4):188–190, Aug. 15, **1959.** fig., table, 13 refs., 4 eqs. **DLC**—The author has submitted his opinion on the trapped neutron radiation often encountered by satellites at low altitudes near the equator. He states what it consists of, its origin and also calculates the expected altitude dependence of the cosmic ray belt as well as the energy spectrum of the protons. Solar corpuscular radiation, connected with magnetic storms and aurora, is believed to exist in the trapped condition at higher latitudes and altitudes and is therefore in origin as well as in location different from the radiation belt found at the equator at low altitudes. *Subject Headings:* **1. Van Allen belt 2. Cosmic radiation.**—*N. N.* Ⓢ

6. ASTRONAUTICS—SATELLITES

See also: **Advances in Space Science** (Ordway, *ed.*), 11.9–2; **Space technology** (Seifert), 11.9–3; **Lunar satellites,** 11.9–17.

11.9–145 551.507.362.1:523.3

Miczaika, G. R. (*Air Res. & Dev. Command, AF Camb. Res. Cent. and Harvard College Obs.*), **Die ersten Mondraketen.** [The first moon rockets.] *Umschau*, Frankfurt a.M., 59(7):193–195, April **1959.** 2 figs. (photo), table, 6 refs. **DLC**—This review gives some structural characteristics and details on the first three U. S. moon-bound rockets and a Russian one. Instrumentation and objectives of the moon-orbital attempts are also considered. No data are given. *Subject Heading:* **1. Moon rockets.**—*W. N.* Ⓢ

11.9–146 551.501.7:551.507.362.2

Farnborough, England. Royal Aircraft Establishment, **Table of artificial Earth satellites.** *Nature*, London, 183(4675):1566, June 6, **1959.** table only. **DWB**—The table includes all known orbiting satellites up to May 8, 1959. The data are: name, launching date, life time, descent data, shape and weight, orbital inclination deg., orbital period min., perigee height in miles, apogee height in miles, orbital eccentricity and argument of perigee deg. *Subject Heading:* **1. Satellite observatories.**—*W. N.* Ⓢ

11.9–147 551.501.8:551.507.362

Miner, Richard Y. (*Arma Div., Amc. Bosch Arma Corp., Garden City, N. Y.*), **Experimental observation of space vehicles.** *Navigation*, Los Angeles, 6(4):252–263, **1959.** 9 figs., 7 refs. **DWB, DLC**—The purpose of this article is to stimulate the interest in visual and radio observations of rockets and satellites. The observational requirements of both methods are itemized and the application of instruments and other devices are described. Procedures of forecasting and subsequent conversion to apparent position and time are explained including the use of and the plotting on charts and coordinate system grids, etc. *Subject Headings:* **1. Satellite observation methods 2. Rocket observation methods.**—*W. N.* Ⓢ

11.9–148 535.417:551.501.8:551.507.362.2

Merson, R. H. (*Royal Aircraft Establish., Farnborough, Hants, Eng.*), **Techniques of analysing terrestrial radio and optical observations of earth satellites.** *Astronautica Acta*, Vienna, 5(1):26–39, **1959.** 8 figs., 2 tables, 5 refs., eq. English, German and French summaries p. 26. **DWB.** Also issued in *International Astronautical Congress, Amsterdam, Aug. 1958, Proceedings of the 9th Congress*, Vol. 2:828–841, issued **1959.** 8 figs., 2 tables, 5 refs., eqs. English, German and French summaries. **DLC** (TL787.I44)—After a brief description of the R. A. E. satellite prediction service and a short section on Doppler measurements and their analysis, this paper goes on to describe the main features of radio interferometer and kine-theodolite observations of satellite orbits made by the staff of the Royal Aircraft Establishment. The development of a method of analysing the observations on a digital computer is given in broad outline, together with estimates of the accuracy with which a satellite's position can be determined. A table of orbital elements of the second Russian satellite is included and a comparison is made between the theoretical and observed values of the rate of rotation of the orbital plane. These differ by 0.7% and indicate the possibility of improving the accepted

values for the coefficients in the formula for the earth's gravitational potential field. *Subject Headings:* **1. Satellite orbit data 2. Satellite optical observation techniques.**—*Author's abstract.* Ⓢ

11.9–149 551.501.8:551.507.362.2

†Moorcroft, D. R. (*Radio Physics Lab., Defence Res. Board, Ottawa*), **Radio tracking of earth satellites.** *American Journal of Physics*, N. Y., 27(2):73–86, Feb. **1959.** 17 figs., 24 refs., 71 eqs. **DWB**—The characteristics of artificial earth satellite orbits are summarized and related to an observer on the surface of the earth. Equations and analytical approaches are developed for determining the orbit of a transmitting satellite using information from equipment for measuring the Doppler shift of the transmitted signal. These are extended to include observations with an array of interferometers (several different arrangements are considered). *Subject Headings:* **1. Satellite orbits 2. Radio satellite tracking.**—*Author's abstract.* Ⓢ

11.9–150 551.521.1:551.507.362.2:521.6

Musen, Peter (*Natl. Aeronautics and Space Admin., Wash., D. C.*), **The influence of the solar radiation pressure on the motion of an artificial satellite.** *Journal of Geophysical Research*, Wash., D. C., 65(5):1391–1396, May **1960.** 3 refs., 43 eqs. **DLC**—This article reports an investigation of the effect of solar radiation pressure on the motion of an artificial satellite. The theory has been applied to the orbit of the Vanguard I satellite, and is found to produce significant perturbations in the perigee height of that satellite. In the case of a satellite with a large ratio of area to mass the major terms introduced by solar radiation pressure can reduce the perigee distance at the rate of 1 to 2 km per day, so that the lifetime of the satellite will become considerably shorter than it would be without this effect. *Subject Headings:* **1. Satellite orbits 2. Solar radiation pressure effects on satellites.**—*Author's abstract.* Ⓢ

11.9–151 551.521.1:551.507.362.2

Wyatt, Stanley P. (*Univ. of Illinois Obs.*), **Solar effects in the motion of Vanguard.** *Nature*, London, 184(4683), Supp. No. 6:351–352, Aug. 1, **1959.** table, 4 refs. **DWB**—The period changes of satellite 1958β 2 (Vanguard) is correlated with three solar effects: the hour angle of the sun as reckoned from the perigee point of the orbit; the 27-day variations in solar activity as discovered by JACCHIA; the total daily solar insolation at the latitude of perigee. There is a relative rate of period decrease because of atmospheric drag as the satellite nears its perigee point of elliptical orbit. This is accounted for as caused by either the daily expansion and contraction of the exosphere or by the daily variation of ionization in the exosphere. *Subject Headings:* **1. Solar effects on satellites 2. U. S. satellite Beta two.**—*N.N.* Ⓢ

11.9–152 551.507.362.2:550.388.2

Zonov, Iu. V., **K voprosu o vzaimodeĭstvii sputnika s magnitnym polem Zemli.** [On the problem of the interaction between a satellite and the earth's magnetic field.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 3:118–124, **1959.** 4 figs., 4 refs., 18 eqs. **DLC, DWB.** Summary in *U. S. National Aeronautics and Space Administration, Technical Translations*, F-8:10–11, April **1960.** Complete transl., *Ibid.*, F-37, May **1960.** 11 p.—This study considers first the currents induced by the translational motion of a satellite relative to the magnetic field, then by the change in the speed of rotation of a satellite about its own axis, due to eddy currents and, finally, by the disturbing forces exerted by the magnetic field on a satellite that has no rotation of its own. *Subject Heading:* **1. Satellite-magnetic field relationships.**—*Author's abstract.* Ⓢ

11.9 153 551.521.1:621.47

Hock, D. C.; McMillan, F. N. and Tanguay, A. R., **Photon propelled space vehicles.** *Institute of Radio Engineers, N. Y., Proceedings*, 48(4):492–496, April **1960.** 5 figs., 4 tables, 2 refs., 38 eqs. **DLC**—The interplanetary trajectories of vehicles propelled by solar radiation pressure are analyzed, and are shown to be logarithmic spirals if thrust direction is constant with respect to the vehicle-sun line. The required thrust may be obtained with a solar sail. Sail size as a function of trip time to Mars is determined for solar thrust, oriented tangent to the

trajectory. Solar propulsion is compared with chemical and electrical propulsion. It is shown that a solar-sail-powered space vehicle on a journey form earth to Mars operates with a payload and flight time penalty when compared with a ballistic vehicle. However, the work capacity per unit weight of a solar sail is calculated to be superior to an electrical engine, which in turn is vastly superior to a chemical engine when the work is compared on the basis of equal flight times. *Subject Heading:* **1. Solar propulsion of space vehicles.**—*Authors' abstract.* Ⓢ

11.9–154 551.507.362.1:629.19:629.1.03

†Sutton, George Paul (*MIT*), **Rocket propulsion systems for interplanetary flight.** *Journal of the Aero/Space Sciences*, N. Y., 26(10):609–625, Oct. **1959.** 16 figs., 6 tables, 41 refs., eqs. **DLC**—A comparison is made of several different propulsion systems for interplanetary flight. Liquid and solid propellant rockets, propulsion systems which use nuclear energy sources, arc heating rockets, magnetoplasma devices, ion rocket propulsion, solar heating rockets, and solar sails are briefly described and their current status reviewed. Engine performance requirements for different interplanetary missions are established. These several propulsion systems are then compared on the basis of several performance criteria, environmental characteristics, vehicle requirements, reliability, current status, growth potential, and efficiency. Predictions on various propulsion system capabilities and an analysis of multiple rocket engine reliability is included. It is concluded that electrical rockets are superior for long-time interplanetary flight applications, and that chemical rockets are satisfactory for most of the immediate applications in "near" space. None of the several propulsion schemes discussed can be rejected until further technical work has been accomplished. *Subject Heading:* **1. Rocket propulsion.**—*Author's abstract.* Ⓢ

11.9–155 531.55:523.2

Chapman, Dean R., **An approximate analytical method for studying entry into planetary atmospheres.** *U. S. National Aeronautics and Space Administration, Technical Report* R-11, **1959.** 44 p. 28 figs., table, 17 refs., numerous eqs. **DWB** (629.1388 U585tr-R)—The pair of motion equations for entry into a planetary atmosphere is reduced to a single, ordinary, nonlinear differential equation of second order by disregarding two relatively small terms and by introducing a certain mathematical transformation. The reduced equation includes various terms, certain of which represent the gravity force, the centrifugal acceleration, and the lift force. If these particular terms are disregarded, the differential equation is linear and yields precisely the solution of ALLEN and EGGERS applicable to ballistic entry at relatively steep angles of descent. If all the other terms in the basic equation are disregarded (corresponding to negligible vertical acceleration and negligible vertical component of drag force), the resulting truncated differential equation yields the solution of SANGER for equilibrium flight of glide vehicles with relatively large lift-drag ratios. A number of solutions for lifting and nonlifting vehicles entering at various initial angles also have been obtained from the complete nonlinear equation. These solutions are universal in the sense that a single solution determines the motion and heating of a vehicle of arbitrary weight, dimensions, and shape entering an arbitrary planetary atmosphere. One solution is required for each lift-drag ratio. These solutions are used to study the deceleration, heating rate, and total heat absorbed for entry into Venus, Earth, Mars, and Jupiter. From the equations developed for heating rates, and from available information on human tolerance limits to acceleration stress, approximate conditions for minimizing the aerodynamic heating of a trimmed vehicle with constant lift-drag ratio are established for several types of manned entry. A brief study is included of the process of atmosphere braking for slowing a vehicle from near escape velocity to near satellite velocity. *Subject Headings:* **1. Entry into planetary atmospheres 2. Ballistic entry equations.** —*Author's abstract.* Ⓢ

11.9–156 551.507.362.2:521.312.7

Good, R. Earl, **Method for predicting the lifetime of a near satellite.** Massachusetts Institute of Technology. Naval Supersonic Lab., Contract AF 19(604)-5894, Technical Report No. 418, Jan. **1960.** 57 p. 15 figs., 2 tables, 12 refs., eqs.—The behavior of satellite orbits under the perturbing effect of atmospheric drag is studied in order to determine the life-

time of a satellite. The wide extremes in drag coefficient, velocity, and density that a satellite experiences during one revolution is studied for possible methods of removing uncertainties in the lifetime predictions. By dividing the satellite lifetime into three phases-circularization, spiral decay, and terminal—approximate methods can be developed to estimate the satellite lifetime in each phase. The method developed is based on the law of conservation of energy. It considers a differential loss in energy per revolution through the drag; and then by integrating N number of revolutions, the total change in the ellipse shape is determined per revolution. The lifetime of the satellite is then the sum of the revolutions in each phase. *Subject Headings:* **1. Satellite lifetime 2. Satellite drag.** —*Author's abstract.* Ⓢ

11.9–157 551.507.36.2

Jastrow, R. and Harris, I. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **Fall of the Sputnik I rocket.** *Science*, Wash., D. C., 127(3313):1499–1500, June 27, **1958.** 2 figs., 4 refs. **DLC** —This analysis by the Lincoln Laboratory is based on their frequently conducted altitude observations by means of a RRE radar in the last five days of the Sputnik I, or rather the Alpha I carrier rocket. The last datum point taken at 71 mi over Malvern, Eng. indicated that the rocket passed by and probably disintegrated at 45 N lat., 106 E long. in outer Mongolia, Dec. 1, 1957 at 0846 G.M.T. *Subject Headings:* **1. Satellite disintegration 2. U.S.S.R. satellite Alpha one.**—*W.N.*

11.9–158 629.13:061.3

Abbott, Ira H. (*Asst. Dir. of Research, NASA*), **Extramural science and research activities of the National Aeronautics and Space Administration.** *Washington Academy of Sciences, Journal*, 49(3):87–89, March **1959. DLC**—NASA was created by the National Aeronautics and Space Act of 1958, with the objective to continue, on a greater scale, the work of NACA which was established in 1915 to conduct research in the fields of aeronautics. To this work NASA adds also the direct responsibility for research for peaceful purposes in the fields of space and space technology. Langley, Ames and Lewis Research Centers are already in operation and will continue to operate. With respect to new functions NASA intends to: 1) develop in its own staff a relatively small but highly skilled organization capable fully to meet responsibilities in planning and programming, 2) contract with industry for the design, development and construction of space vehicles and components, 3) conduct an intensive and greatly increased program of scientific research in cooperation with educational and research institutions. *Subject Heading:* **1. National Aeronautics and Space Administration.**—*I.S.* Ⓢ

E. SOLID EARTH GEOPHYSICS

1. VOLCANOLOGY

11.9–159 550.3

†Fu, C. Y., **Methods and problems of geophysics.** *Academia Sinica. Institute of Meteorology, Scientific Papers, Contribution* 171, **1948.** 15 p. 22 refs. Reprint from *Chinese Geophysical Society, Journal*, 1(1), June **1948. DWB**—A general discussion of scope, methods and problems (such as origin of solar system, the earth's core, movements of crust, and geophysical exploration) of geophysics, which is distinguished from geology by being mathematical by nature. *Subject Headings:* **1. Geophysical methods 2. Geophysical problems.**—*M.R.*

11.9–160 551.5:550.36

Grigor'ev, A. A., **Problema schimbului reciproc dintre substanţe şi energie în litosferă, hidrosferă şi atmosferă şi importanţa ei în teoria generală a geografiei fizice.** [The problem of matter and energy exchange in the lithosphere, hydrosphere and atmosphere and its significance for the general theory of physical geography.] *Academia Republici Populare Romane. Institutul de Stud i Romzno-Sovietice, Seria Geologie-Geografie*, 2(13):71–87, **1953.** refs. **DLC.** Translation from *Akademiia Nauk SSSR, Izvestiia, Ser. Geograf.*, No. 4:12–27, **1952.**—For abstract (based on German translation) *see item* 4.9–21, Sept. 1953, *Met. Abstracts. Subject Headings:* **1. Geophysics 2. Meteorological philosophy.**

11.9–161 551.24(09)

von Bubnoff, Serge, **Die Geschichte der Erde.** [History of the earth.] *Naturwissenschaften*, 42(11):328–337, June 1, **1955.** 5 figs. **DWB**—A study of the rhythmic changes in the geography of Europe, from the Cambrian onwards. Elevation accompanied by mountain building, alternating and subsidence, caused widespread emergence and inundation. Radioactive dating shows that these cycles have become progressively shorter, and the suggestion is made that the solar year has become shorter measured by the standard of radioactivity. Ice Ages and deserts fall in periods of greatest continentality. The influence of the cycle on the appearance of new types of life is discussed. *Subject Heading:* **1. Geological history.**—*C.E.P.B.*

11.9–162 525.3 551.241

†Irving, E. and Green, R., **Polar movement relative to Australia.** *Geophysical Journal*, London, 1(1):64–72, March **1958.** 5 figs., table, 25 refs. **DWB**—During Upper Proterozoic times the mean geomagnetic pole seems to have been situated near Australia. By the Cambrian it appears to have moved to what is nowadays the region of South Africa passing southwards into the Southern Ocean by Silurian and early Devonian times. In the Upper Carboniferous and Permian the pole lay in the Tasman Sea and Australia was once again in a high geomagnetic latitude. Later the pole moved slowly southwards, reaching the present geographic pole towards the end of the Tertiary. *Subject Heading:* **1. Polar displacement.**—*Authors' abstract.*

11.9–163 525.3

Schmeidler, Felis, **Die Schwankungen der Erdachse.** [Variations of the earth's axis.] *Naturwissenschaftliche Rundschau*, 10(6):205–207, June **1957.** fig. **DWB**—In 18th century, EULER showed that earth's axis must fluctuate in a period of about 10 months. CHANDLER found in observations periods of 12 and 14 months, the actual curve being complicated and of variable amplitude, sometimes reaching 12 m. The annual component is elliptical and may be due to the heaping up of cold air over Asia in winter. Changes in length of day are also found. *Subject Heading:* **1. Polar orbit.**—*C.E.P.B.*

11.9–164 550.3:551.326.62(268)

Crary, A. P. (*G. R. D., AF Camb. Res. Cent., Air Res. and Dev. Command*), **Geophysical studies under northern Ellesmere Island.** *Arctic*, Ottawa, 9(3):155–165, **1956.** 9 figs., 7 refs. **DWB, DLC**—The geophysical studies reported in this paper cover observations on seismic depths mostly along an east-west line extending from Ward Hunt Island to the ice rise north of Cape Discovery. The bathymetric chart of the area and seismic records showing bottom and sub-bottom reflections are presented. Graphs show the pre-summer salinities and temperature as compared with the values obtained at Ice Island T-3 in April 1954, when it was about 300 km northeast of Ward Hunt and variations of water temperature and salinity during the summer season. Finally, a map showing the magnetic variations along Ellesmere Island is reproduced. *Subject Headings:* **1. Geophysical observations 2. Oceanographic observations 2. Seismic ice soundings 4. Ellesmere Island.**—*I.L.D.*

2. GRAVITY

11.9–165 526.73

Cook, A. H., **Comparison of the acceleration due to gravity at the National Physical Laboratory, Teddington, the Bureau International des Poids et Mesures, Sèvres, the Physikalisch-Technische Bundesanstalt, Brunswick, and the Geodetic Institute, Potsdam.** *Royal Society of London, Proceedings, Ser. A*, 213(1114):408–424, July 8, **1952.** 9 tables, 19 refs. **DWB**—From comparisons with invar pendulums, the value of gravity at N.P.L. on Potsdam system calculated as 981,196.29±0.3 m. gal. Some determinations at other places in Europe are recalculated and absolute values found. These show that the accepted value of 981,274 at Potsdam is much too high but no exact value can be given yet. *Subject Heading:* **1. Gravity.**—*C.E.P.B.*

11.9–166 526.7:550.312

Schutte, H., **Die Bestimmung der Abplattung der Erde aus der Schwereverteilung nach dem Schwereverzeichnis von N. F. Zhuravlev.** [The determination of the flattening of the earth from the distribution of gravity according to the indications of N. F. Zhuravlev.] *Beiträge zur Geophysik*, 62(1):9–26, **1952.** 8 tables, 11 refs., eqs. **DLC**—After discussing numerous gravimetric determinations author adopts as a most probable value of flattening at poles $(a-b)/a = 1/295.7$; a = equatorial, b = polar radius. *Subject Heading:* **1. Gravity.**—*C.E.P.B.*

3. SEISMOLOGY

See also: **Microseism-typhoon relationships** (Kishinouye, Kotaka), 11.9–255.

11.9–167 550.341.6

†Byerly, Perry (*Univ. of Calif., Berkeley*), **Subcontinental structure in the light of seismological evidence.** *Advances in Geophysics*, Ed. by H. E. Landsberg, 3:106–152, **1957.** 16 figs., 98 refs., eqs. **DWB, DLC**—A systematic survey of a large number of significant seismological studies of the earth's crust since 1907 (through 1955) and with special emphasis on studies of blast waves (accidental and intentional). *Subject Headings:* **1. Seismic sounding techniques 2. Subcontinental structure 3. Seismology.**—*M.R.*

11.9–168 550.341.6

*Caloi, Pietro, **L'astenosfera come canale-guida dell'energia sismica.** [The asthenosphere as conductor of seismic energy.] *Annali di Geofisica*, Rome, 7(4):491–501, Oct. **1954.** 17 figs. (many fold.), ref. Italian and English summaries p. 498–500. **DLC**—The layer between 40 and 300 km depth where velocity of propagation of seismic waves decreases slowly with depth, reaches a minimum at 80–100 km depth and then increases slowly at the same rate, is called the asthenosphere. This "low velocity layer" is adapted to transmit seismic energy if it is injected parallel to its limiting surfaces or at an angle which will allow it to be reflected to great distances. Article contains many illustrations of records, both original and computed. *Subject Headings:* **1. Seismology 2. Asthenosphere.**—*M.R.*

11.9–169 550.34

Toperczer, M., **Zur Definition der Seismizität** [On the definition of seismicity.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 5(4):377–385, **1953.** 6 refs., 10 eqs. German, English and French summaries p. 377. **DWB**—As a definition of absolute surface energy e_i of an earthquake, the author proposes $e_i = e_0 \cdot 10^{1.8Mi}$, where Mi is the magnitude of the earthquake. As a relative measure he uses $w = J \cdot fj$ where J is maximum intensity and fj area of damage. As seismicity of an area F in p years he proposes $\Sigma w/Fp$. *Subject Heading:* **1. Seismology.**—*C.E.P.B.*

11.9–170 550.34

Trapp, E., **Ableitung der Magnitudengleichung für die Erdbebenstationen Wien und Graz und allgemeine Bemerkungen zur Magnitudenberechnung.** [Derivation of the magnitude equation for the seismic stations Vienna and Graz and general remarks on magnitude calculation.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 6(3–4):440–450, **1954.** 3 tables, 9 refs., 15 eqs. German, English and French summaries p. 440–441. **DLC**—Computation of seismic magnitude is described and a table of earthquake characteristics at Vienna and Graz is given (1925–1936). The various components of the magnitude are discussed. *Subject Heading:* **1. Seismology.**—*C.E.P.B.*

11.9–171 550.341.2

Trapp, E., **Beispiel einer einfachen Darstellung der Bebentätigkeit in einem engbegrenzten Gebiet.** [Example of a simple exposition of earthquake activity in a closely limited region.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 9(4):514–518, **1957.** 2 figs., 2 tables. German, English and French summaries p. 514. **DWB**—The Voitsberg region is inactive seismologically but is surrounded by seismic centers. These are shown graphically. *Subject Heading:* **1. Seismology.**—*C.E.P.B.*

11.9–172 550.342 (262.5)

Monakhov, F. I. and Dolbilkina, N. A., **Struktura mikroseĭsm.** [Structure of microseisms.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 8:937–946, Aug. **1958.** 7 figs., 2 refs., 2 eqs. **DLC**—The structure of microseisms originating in the Black Sea and the North Atlantic and their oscillations in space were investigated with the method of azimuthal phase correlation. Observations by the azimuthal installation, which included a seismograph and galvanometer with the parameters $T_0 = 3$ sec., $D_0 = 1.5$; $T_1 = 6.7$ sec., $D_1 = 0.5$, were begun in Yalta in the fall of 1956 and continued to the spring of 1957. The equations of the axis of the simultaneous phase of the Rayleigh and Love waves and of the dependence of the amplitudes upon the azimuths of the seismograph are presented; the precision and error in the determination of phase shifts, the distinction between Rayleigh and Love waves are discussed; and the method of position phase correlation is described with the aid of a diagram. The results of measurements show that the Love waves were almost completely absent in all cases, that Rayleigh waves, uncomplicated by interference, constituted about 5% of the Black Sea and about 15% of the North Atlantic microseisms. A large part of the oscillations is complex and is manifested most strongly in the Black Sea microseisms. The planes of the oscillations in the Rayleigh waves are oriented basically toward the source of the microseisms and in most cases they form a particular angle with the vertical. *Subject Headings:* **1. Microseism research 2. Black Sea.**—*Author's summary & I.L.D.*

F. OCEANOGRAPHY AND HYDROLOGY

1. OCEANOGRAPHY

See also: **Offshore oil deposits** (Emery), 11.9–57; **Gulf Stream dynamics** (Newton), 11.9–252.

11.9–173 551.506.5 (262.8) 551.579:551.46

Ovsiannikov, A. N., **Opyt izucheniia gidrometeorologicheskogo rezhima moria.** [Experiment in studying the hydrometeorological regime of the sea.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:48–49, May **1959. DWB, DLC**—The work of the Caspian Expedition of the State Oceanographic Institute during 1950–1955 is described as an example of the extension of investigations of the hydrometeorological regime of the sea. Observation stations were set up on oil derricks situated at depths of 15 m. Observations of 2nd order stations were obtained. These provided 4 synoptic observations, special wind observations, storm observations, etc. Observations on transparency, deformation and refraction of waves, and on currents were also obtained. Observational methods and apparatus were developed; profile wave recorders, electrical contact and brake anemometers were used. Relationships between wind force in Beaufort and waves, between wave height and wind velocity were investigated. The scope and value of the hydrometeorological work on the Caspian Sea is summarized. *Subject Headings:* **1. Oceanographic research 2. Ocean weather stations 3. Caspian Sea.**—*I.L.D.*

11.9–174 551.46.018

Ragozhkin, V. I., **Batometr dlia otbora prob vody.** [Bathometer for taking water samples.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:54–55, May **1959.** fig. **DWB, DLC**—The bathometer described with the aid of diagrams consists of a plexiglass cylinder. Its operation is based upon one of the properties of a cranking-pumping mechanism—the presence of inert points at two extreme positions. The bathometer is put into working condition by pulling off the lower cover by hand, simultaneously the upper cover is opened as a result of the displacement of a cross-bar fastened by ball bearings to a rod in the lower cover. The covers of the bathometer are held in the open position by a spring covering the rod, one end of the spring being fastened to a bracket and the other directly to the rod. The presence of the spring within the bathometer and the relatively low heat conductivity of the plexiglass allows the bathometer to be used with ice at negative air temperature. *Subject Heading:* **1. Bathometers.**—*I.L.D.*

11.9–175 551.46.018

Rymsha, V. A., **Pribor dlia izmereniia malykh skorosteĭ techeniia vody.** [Instrument for measuring the low velocities of a water current.] *Meteorologiia i Gidrologiia*, Leningrad, 9:44–46, Sept. **1958.** 3 figs. (incl. photo), ref. **DWB, DLC**—The construction of an apparatus for measuring water current velocities in the range of 0–5 cm/sec is described. It utilizes a thermal principle based on the dependence between the velocity of a current flowing around a heated body and the intensity of heat transfer from this body to the water. The apparatus consists of a heated element with a heating coil, differential thermocouple, galvanometer, battery, milliammeter and rheostat. The heat exchange between the surface of the heated element, which is placed in the current being investigated, is expressed by Newton's formula $Q=\alpha(T_0-\theta)F\tau$ and for a given element of the apparatus, for $T_0-\theta=1°$ and time $\tau=1$; the heat exchange is $Q=f_0(\alpha)$ since α-(coefficient of heat given off) depends upon velocity of current, W; $Q=f_0(W)$. In case the working element is heated by an electric current $Q=0.24\epsilon I$; in case of constant voltage ϵ from the battery, $I=f_6(W)$. The physical properties of the various elements of the apparatus, the results of calibration of the apparatus and its use are described. The apparatus is illustrated with the aid of a diagram and a photograph. *Subject Heading:* **1. Current velocity measurement techniques.**—*I.L.D.*

11.9–176 551.46.018

Sabinin, K. D., **Novyĭ pribor dlia opredeleniia plotnosti i solenosti morskoĭ vody (solemeter Koksa).** [A new instrument for determining the density and salinity of sea water: the Cox salinometer.] *Meteorologiia i Gidrologiia*, Leningrad, No. 12:47–49, Dec. **1958.** ref., 2 figs. **DLC**—The apparatus for measuring salinity of sea water devised by R. A. Cox, which is based upon the floatation method of determining water density, is described with the aid of a diagram. A modification of this instrument developed in the oceanography department of the Moscow State University is presented. The valves were replaced by stopcocks with markings so as to regulate pressure more exactly, the stopcocks were placed upon a horizontal stand, upon which was placed also the reservoir, the instrument was set up with a minimum use of rubber; a longer thermometer table was used, the float was shaped like a flat retort which was made of molybdenum glass, 1.5 cm in diameter. A diagram of the modified instrument is presented. Its testing, precision and defects are discussed. *Subject Headings:* **1. Cox salinometer 2. Salinity measurement techniques.**—*I.L.D.*

11.9–177 551.46.018

Savur, S. R., **New ocean current meter.** *Andhra Univ., Waltair, India, Memoirs in Oceanography*, 1:122–124, **1954.** 2 figs. **DLC** (GC1.A55)—The instrument is described in detail including two sketches featuring the construction. The measurement of ocean and/or river currents at the surface or any desired depth is directly obtained when certain precautions are taken. *Subject Heading:* **1. Current meters.**—*W.N.*

11.9–178 551.526.6:551.463/4(261)(729.9)

Schroeder, Elizabeth; Stommel, Henry (*both, Woods Hole Oceanog. Inst., Mass.*); Menzel, David and Sutcliffe, William, Jr. (*both, Bermuda Biological Station, St. George's West, Bermuda*), **Climatic stability of eighteen degree water at Bermuda.** *Journal of Geophysical Research*, Wash., D. C., 64(3):363–366, March **1959.** 2 figs., ref. **DLC**—Temperature soundings in the ocean off Bermuda are available for 85 yrs. All records show the water mass just beneath the surface to be remarkably constant in temperature and salinity. Oxygen measurements indicate that this water is in convective contact with the atmosphere each winter. More detailed and frequent measurements made by the ship "Panulirus" are here presented for the first time, substantiating this remarkable and puzzling climatic stability of near-surface water in the northwestern Sargasso Sea. *Subject Headings:* **1. Ocean temperature soundings 2. Ocean temperature-salinity analysis 3. Bermuda 4. North Atlantic Ocean.**—*Authors' abstract.*

11.9–179 551.463:534.2

Anderson, Victor C. (*U. Calif. Marine Phys. Lab. Scripps*), **Arrays for the investigation of ambient noise in the ocean.** *Acoustical Society of America, Journal*, 30(5):470–477, May **1958.**

8 figs., 14 eqs. **DLC.** Reprinted as *California. Univ. Scripps Institution of Oceanography, Contributions*, 1958, issued **1959.** p. 383–390. **DWB** (551.46 C153co)—A discussion of the important parameters to be considered in the use of directional arrays for the study of noise fields in the ocean leads to specialized array designs. Some properties of circular and spherical arrays composed of omnidirectional elements are presented. Consideration of these properties leads to an optimum selection of geometry and element spacing for each of two cases: a distributed noise source, and a set of point noise sources. The calculation of directivity index for a spherical array is carried out by the use of the space-correlation functions of an isotropic noise field. The measured, broad-band directivity pattern of a model circular plane array as a function of frequency is also shown. *Subject Headings:* **1. Submarine acoustics 2. Underwater sound measurement techniques.**—*Author's abstract.*

11.9–180 536.71:546.212 551.463:551.526.6

Eckart, Carl, **Properties of water, Pt. 2, The equation of state of water and sea water at low temperatures and pressures.** *American Journal of Science*, 256(4):225–240, April **1958.** 9 figs., 2 tables, 13 refs., 23 eqs. **DWB, DLC.** Reprinted as *California. Univ. Scripps Institution of Oceanography, Contributions*, 1958, issued **1959.** p. 89–104. **DWB** (551.46 C153co)—The empirical data on the equation of state of pure water have been reviewed and analyzed. Systematic errors in the isotherms are estimated at $\pm 2p \times 10^{-7}$ ml/gm, and the probable error of the best values of specific volume is not less than $\pm 2 \times 10^{-4}$ ml/gm, in the range of $0° \leqslant T \leqslant 40°C$ and $0 \leqslant p \leqslant 1000$ atm. In this region and within this error, the data can be represented by the Tumlirz equation $(p+p_0)(v-v_0)=\lambda$, where p = pressure, v = specific volume, while p_0, v_0 and λ are empirical functions of temperature. The quantity v_0 seems to be actually independent of the temperature and p_0 and λ can be sufficiently well approximated by quadratic functions of temperature. More experimental work is needed to establish these functions with the required precision. The much less numerous data on sea water are also considered. They are certainly no more precise than the data for pure water, and can also be represented by the above equation, provided p_0 and λ are quadratic functions of temperature and linear functions of salinity; v_0 appears to be independent of salinity as well as temperature. The available data do not enable the dependence of the isotherms on salinity to be determined with precision, and more experimental work is needed. Until this becomes available, the formulas derived here must be considered doubtful, but no more so than others in current use. *Subject Headings:* **1. Sea temperature formulas 2. Equations of state for water.**—*Author's abstract.*

11.9–181 551.464:546.282

†Bien, George S.; Contois, David E. and Thomas, William H. (*all, Scripps Inst. of Oceanog., U. Calif.*), **The removal of soluble silica from fresh water entering the sea.** *Geochimica et Cosmochimica Acta*, London, 14(1/2):35–54, **1958.** 11 figs., 9 tables, 22 refs., eq. **DLC, DGL.** Reprinted as *California. Univ. Scripps Institution of Oceanography, Contributions*, 1958, issued **1959.** p. 165–184. **DWB** (551.46 C153co) –Determinations of soluble silica and chlorosity of water samples collected in and around the east Mississippi Delta showed that most of the soluble silica was removed from river-water by some process other than dilution with sea-water. While biological uptake by diatoms can account for part of this removal, it is more likely that a major portion is removed by inorganic precipitation. Laboratory experiments with river-water and sea-water showed that both suspended matter from the river and electrolytes in sea-water are necessary for maximum inorganic precipitation. It is concluded that this process is an adsorption of soluble silica on suspended matter as it comes in contact with electrolytes, rather than a simple formation of salts with electrolytes. The inorganic removal can increase by a maximum of 4.5% the weight of sediment in the water which may be expected to reach the bottom. *Subject Headings:* **1. Suspensions in sea water 2. Silicon removal from sea water.**—*Authors' abstract.*

11.9–182 551.464(09)

Thompson, Thomas G. (*Dept. of Oceanog. Univ. of Wash., Seattle*), **Short history of oceanography with emphasis on the role played by chemistry.** *Journal of Chemical Education*, Easton, Pa., 35:108–112, March **1958.** table, 8 refs. "Presented at Symposium on Chemistry

of the Sea, Amer. Chem. Soc., Miami, April 1957." **DLC**—This paper gives a general review of oceanography from ancient times up to the present. The topics discussed are observations in the 18th and 19th centuries, salinity, chlorinity and chlorosity, life in the sea, etc. *Subject Headings:* **1. History of oceanography 2. Oceanographic chemistry.**—*W.N.*

2. SEA ICE

See: **Heat balance of ice, Arctic** (Iakovlev), 11.9–265; **Pressure effects on Arctic ice** (Rodewald), 11.9–280; **Wind stress on ice, Arctic** (Sverdrup), 11.9–296.

3. HYDROLOGY

See also: **Hydrometeorology Sec.,** p. 1471.

11.9–183 551.579:061.1(477)

Akenov, A. A., **Nachalo raboty po-novomu.** [Beginning work anew.] *Meteorologiia i Gidrologiia*, Leningrad, No. 7:48–49, July **1958. DWB, DLC**—In 1957 local hydrometeorological directorates and their hydrometeorological marine observatories together with the participation of the State Institute of Oceanography and the Far East Scientific Hydrometeorological Institute developed plans for increasing the effectiveness of the marine network and for subjects of hydrological research during the period 1958–1960. The purpose of these plans was to investigate various elements of the hydrological regime while maintaining the necessary minimum of standard observation. The reorganization of the marine network took into account the requirements of the national economy and the experience obtained in studies of the hydrological regime of the Black and Azov Seas. The plan of the work was submitted to the Scientific-Technical Council of the Observatories and the Directorate of the Hydrometeorological Service of the Ukrainian S.S.R. A model for a **Short hydrometeorological reference book** was set up; it was to contain for each station observational data for the post-war period, namely: Pt. I. Meteorological elements; and Pt. II. Marine hydrological elements. The various problems arising in the compilation of the reference book caused by defects in available observational data or their inadequacy are discussed. *Subject Headings:* **1. Hydrologic services 2. Meteorological services 3. Ukrainian S.S.R.**—*I.L.D.*

11.9–184 551.579.4:551.515.13(472)

Freĭdzon, A. I., **Redkiĭ sluchaĭ navodneniia v Leningrade** [A rare case of flooding in Leningrad.] *Meteorologiia i Gidrologiia*, Leningrad, No. 7:35–36, July **1959** fig. **DWB, DLC**—Various floods which occurred during 255 years (1703–1957) in the Leningrad area are briefly reviewed in respect to their maximum rise, rate of rise and effects of cyclone movements. *Subject Headings:* **1. Floods 2. Cyclone movement-flood relationships 3 Leningrad, U.S.S.R.** —*N.P.S.*

11.9–185 551.579.4:551.482.215.3(282.244.3,44,45)

Striffling, Maurice, **Sur les causes météorologiques des crues concomitantes du Rhône et du Pô.** [Meteorological causes for concomitant floods of the Rhone and Po rivers.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):119–122, **1959** 4 figs., ref. French, German and English summaries p. 119. **DWB, DLC**—Concomitance between increases of Rhone and Po has been for a long time described by Pardé. Based on data provided by this author, an attempt is made to indicate the delay between the two phenomena. Then, comparing for specified days the rain gage observations on the French and Italian sides, the relation between these phenomena and ground and high-level meteorological situation is sought. *Subject Headings:* **1. Floods 2. River hydrology 3. Rhone River, France 4. Po River, Italy** —*Author's abstract.*

11.9–186 551.579.4:551.324:061.3(584.6)

Vetiutnev, A. V., **Seminar po izucheniu seleĭ.** [Seminar on the study of flash floods *Meteorologiia i Gidrologiia*, Leningrad, No. 7:66, July **1958. DWB, DLC**—A seminar on

problems of observations of flash floods and methods of forecasting them was held during Feb. 21–March 6, 1958, in Alma Ata under the sponsorship of the Kazakh Scientific Hydrometeorological Institute. Representatives of the Central Asian Hydrometeorological Institute participated. Reports were presented on the general conditions of the formation of flash floods and their forecasting (S. P. Kaveiskiĭ), general synoptic conditions of rain showers (R. S. Golubov), flash floods in glacier regions (M. P. Rybkina), etc. The seminar resolved that the Kazakh Scientific Institute of Hydrometeorology should be the center for studies and consultation on flash flood problems. *Subject Headings:* 1 **Flash floods** 2 **Flash flood forecasting** 3. **Kazakhstan S.S.R.**—*I.L.D.*

11.9–187 551.579 2:551.43

Mosienko, N. A., **Sklonovyĭ stok na Priobskom plato.** [Slope runoff on the pri-Ob plateau.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:32–36, June **1958** 4 tables, 9 refs. **DWB, DLC**—In planning of shallow estuaries on slopes, slope runoff only is used. The distribution of snow cover, upon which runoff depends in the Ob plateau (Kulunda Steppe), is largely in the watershed area and on the ridges. Runoff coefficients from small catchment basins in the Rodinsk district of the Altai Territory for the spring of 1954, 1955 and 1956; data giving the quantitative expressions of factors of surface runoff of meltwater in the basin of the Rodinsk Lake (virgin steppe) according to snow deposition data for 1955, 1956 and 1957; data on the runoff coefficient of the Kuchuk River and runoff from medium and watershed parts of the slopes (1954–1957); and data on the dependence of the coefficient of runoff of small catchment basins upon the percent flowing (basin of Burla River) are presented. In years with small supplies of water on the surface of the soil and with large losses of runoff, both slope and channel runoff were small. Slope runoff in 1956 amounted to 11.6 mm and river runoff to 5.2 mm. The runoff coefficient was 0.50 and 0.16, respectively. In years with large supplies of water, the slope runoff amounted to 52.0 mm and the river runoff 14.1 mm; the corresponding runoff coefficients were 0.80 and 0.14. Transverse autumn plowing in most cases regulates surface runoff to a greater degree than do fallow land and fields. *Subject Headings:* 1. **Slope runoff** 2. **River runoff** 3. **Ob Plateau, U.S.S.R.**—*I.L.D.*

11.9–188 551.579.5:628.1

Bogomolov, G. V. and Plotnikov, N. A., **Classification des ressources d'eaux souterraines et évaluation de leurs réserves.** [Classification of the sources of supply of subterranean waters and evaluation of their reserves.] (In: I.U.G.G. Association of Scientific Hydrology, **Symposia Darcy, Dijon, Sept. 1956 [Proceedings]**, pub. **1957.** Vol. 2:263–271. 3 figs., table.) **DWB** (M79 I61sym)—To a great extent, human life and activities depend on subterranean waters. Much time and effort has been spent on determination of the availability of this valuable natural resource and to the study of the associated problems. The U.S.S.R. has classified subterranean waters under five major categories. In this report the characteristics of their hydrological investigations have been summarized. *Subject Headings:* 1 **Underground water resources** 2 **Water source classifications**—*N.N.*

11.9–189 551.579 5:546.291

Carter, Ralf C.; Kaufman, W. J.; Orlob, G. T. and Todd, David K. (*all, Dept. of Civil Engin., Univ. of Calif.*), **Helium as a ground-water tracer.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2433–2439, Dec. **1959.** 7 figs., table, 10 refs. **DLC**—Laboratory and field experiments were conducted with helium as a ground water tracer. Techniques were developed for the addition and extraction of helium from water. A mass spectrometer and a pressure-volume apparatus were used for helium measurements at concentrations in water ranging from 1.5 to 5.5×10^{-4} milligrams per liter. In the field investigation, flow was traced through a confined aquifer for a distance of 188 ft. Both laboratory and field experiments showed that helium traveled at a slightly lower velocity than chloride. The advantages of helium as a ground water tracer are its safety, low cost, relative ease of analysis, low concentrations required, and chemical inertness. The disadvantages include the relatively large errors in analysis, difficulties of maintaining a constant recharge rate, time required to develop equilibrium conditions in unconfined aquifers, and possible loss to the atmosphere in uncon-

fined aquifers. *Subject Headings:* **1. Ground water tracers 2. Helium tracer techniques** — *Authors' abstract.*

11.9–190 628.13:551.579

Gorrie, R. Maclagan, **Water resources and water needs in Scotland.** *Nature*, London, 182(4644):1193–1195, Nov. 1, **1958.** fig. **DWB**—Symposium on **Water resources and water needs in Scotland** held by Section E (Geography) of the British Association during September 1958. Included papers on the need for river flow studies, evaporation and land use in water conservation studies, industry in relation to water supply and others. *Subject Headings:* **1. Water resources 2. Water conservation 3. Scotland.**—*N.N.*

4. GLACIOLOGY

See: **Quaternary glaciation** (Peive), 11.9–323.

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Arctic weather stations,** 11.9–30; **Wind finding accuracy** (Willis), 11.9–39; **Radar obs. of meteor echoes** (Manning), 11.9–103; **Radar echoes from meteor trails** (Manning), 11.9–104; **Determination of angle of arrival of auroral echoes** (Harang, Thöim), 11.9–125; **Table of artificial satellites,** 11.9–146; **Satellite obs. methods** (Miner), 11.9–147; **Satellite optical obs. techniques** (Merson), 11.9–148; **Radio satellite tracking** (Moorcroft), 11.9–149; **Temp. reduction** (Bider et al.), 11.9–274; **Temp. measurement** (Prokudina), 11.9–278; **Turbulence measurement** (Greenhow, Neufeld), 11.9–286.

11.9–191 551.501.3:551.524.36

Kyriazopoulos, Basil D. (*Univ. of Thessalonike*), **Unit of wintriness, degree of wintriness and winter day.** *Thessalonike. Panepistēmion. Ergastērion Meteorologias, Meteōrologika*, No. 6, **1958.** 29 p. 7 figs., 9 tables, 8 refs. **DWB**—Definitions of the terms "unit of wintriness" and "winter day" are discussed in this paper, and a comparative study between the degrees of wintriness of the winters and the winter months for two stations, Thessalonike and Istanbul, has been made. The author examines the prevailing weather conditions in these areas during the winter days. *Subject Heading:* **1. Wintriness.**—*N.N.*

11.9–192 551.501.45:551.557.3:519.241.1

Charles, B. N. (*Sandia Corp., Albuquerque, N. Mex.*), **Utility of stretch vector correlation coefficients.** *Royal Meteorological Society, Quarterly Journal*, 85(365):287–290, July **1959.** 4 figs., table, 7 refs., 3 eqs. **DWB, DLC**—This paper compares empirical values of the vector stretch correlation coefficient, and the total vector correlation as fundamentally defined. The former is apparently sufficiently accurate when applied to temporal stretch alone, up to three days, but when applied to space stretch, it may have little meteorological meaning unless it exceeds about 0.3 in large data samples (about 450 daily observations). *Subject Headings:* **1. Vector stretch correlation coefficient 2. Wind vector calculations.**—*Author's abstract.*

11.9–193 551.501.7:551.547.1

Johnson, D. H., **The accuracy of 100 mb. contour heights.** *Meteorological Magazine*, London, 83(980):37–39, Feb. **1954.** table, 2 refs., eqs. **DWB.** Also issued as: *Great Britain, Meteorological Research Committee, M.R.P.*, 800, April 24, **1953.** Mimeo. 4 p. table, 2 refs., eqs.—Observed winds at 100 mb over British Isles are reasonably accurate, and discrepancies with slope of 100 mb levels are due to errors in the latter. Comparisons give standard error in height measurement of 100 mb surface as 145 ft. *Subject Headings:* **1. Baric topography 2. Upper air wind computation.**—*C.E.P.B.*

OBSERVATIONAL DATA

See also: **Sec. A4,** p. 1385; **Pilot balloon obs.** (Mikhel'), 11.9–11; **Long period temp. records** (Bider et al.), 11.9–274; **Long period ground temp. record** (Müller), 11.9–279.

11.9–194 551.506.1:551.582.1(410)

Booth, R. E., **Looking back on 1958.** *Weather*, London, 14(5):171–175, May **1959.**—A summary of the 1958 weather conditions in the British Isles is given. It was predominantly mild in January; February had mild weather alternated with cold spells; March was exceptionally cold with a mean temperature of 4°F below the average. April and May had unsettled weather and this continued throughout June, July and August, except in northwest Scotland. Late spring and summer weather was wet; so was autumn in England and Wales. November and December were foggy and rainfall was above average. At Kew, December was the wettest in 20 yrs. The rest of the report compares weather conditions in Canada, Europe, U.S.S.R. and the U.S. with conditions in the British Isles during the year. *Subject Headings:* **1. Weather conditions 2. Climate of British Isles 3. British Isles.**—*N.N.*

11.9–195 551.506.22:551.510.534 551.510.41:546.264

Vassy, Arlette, **L'étude de l'ozone atmosphérique pendant l'Année Géophysique Internationale.** [The study of atmospheric ozone during the IGY.] *La Nature*, Paris, No. 3299:101–105, March **1960.** 7 figs. **DLC**—The International Ozone Commission within the I.U.G.G. gathers data together on atmospheric ozone from various parts of the globe. In order to obtain a world-wide insight into the question, the IGY has intensified the international co-operation. From July 1, 1957 to Dec. 31, 1958, 90 stations belonging to 27 countries have contributed to the IGY program which involved daily measurements of the reduced thickness, the concentration at ground level and the vertical distribution of atmospheric ozone. France had 8 stations, three of which were situated in the Antarctic. The principal characteristics of atmospheric ozone, its optical properties, its geophysical role, the main observational methods and the various measuring instruments are successively examined. In meteorology, the study of ozone is of great interest. It enables conclusions to be drawn concerning temperature and pressure of the upper atmosphere; it indicates the existence of a warm layer at about 50 km; it makes possible the tracing of large atmospheric motions, polar air outbreaks, intertropical front displacement, etc. The raw data collected during the IGY are brought together in a World Center charged with analyzing and publishing them. Among the first results of the IGY it is noteworthy to point out the anomalies observed in the Antarctic. The reduced thickness presents an important maximum at the end of November, i.e. one month before the summer solstice. Surface measurements show a maximum in the height of summer, with a secondary maximum in June, in the depth of winter. At slightly lower latitudes, a strong maximum appears from September to December. As concerns the vertical distribution, the direct measurements prove that the standard distribution pattern (with a maximum at about 20 and 30 km) is observed in only one half of the cases. Two pronounced maximums are often observed, the secondary maximum being situated in the troposphere below 18 km. *Subject Headings:* **1. Ozone layer 2. Vertical ozone distribution 3. Upper air temperatures-ozone relationships 4. Ozone near the ground 5. IGY atmospheric ozone program.**—*A.V.*

11.9–196 551.506.3(059):551.583.3(410)

Oliver, J. (*Dept. of Geography, Univ. College of Swansea*), **The use of weather diaries in the study of historic climates.** *Weather*, London, 13(8):251–256, Aug. **1958.** 9 refs. **DWB**—The value of historic weather descriptions, such as those recorded by BULKELEY, a farmer from North Wales, MANLEY and others 1734–1760, is discussed. Daily, seasonal and annual features of weather and climate in the British Isles can be discerned and add to the scanty statistical data available; hence search for diary information about past weather conditions should be encouraged. *Subject Headings:* **1. Weather diaries 2. Historic climates 3. Climate of British Isles 4. British Isles.**—*W.N.*

11.9–197 551.506.8:551.58:63(43-15)

Schnelle, F. (*Weather Bureau, Offenbach, Main*), **Phänologie: Pflanzenentwicklung im Jahresrhythmus: Ergebnisse weltweiter Beobachtungen.** [Phenology: Plant development

in the annual cycle: results of observations over the world.] *Umschau*, Frankfurt a.M., 59(16):488–491, Aug. 15, 1959. 2 figs., 2 tables. **DLC**—Phenological climatology provides climatic data calculated according to natural vegetation periods. It unites the dates of the beginning of marked growth phenomena of cultivated plants and fruit trees with such climatic data as mean temperatures, precipitation totals, precipitation frequencies, etc. By means of a table showing the precipitation conditions during the agriculturally most important vegetation periods of the year for the station Michelau near Luhtenfels (upper Main Valley) calculated for the period 1936–1949, the author illustrates the different precipitation frequencies occurring during the individual growth periods. These different phenological—climatological data provide the farmer with information on the probable amount of precipitation available during planting, cultivating and harvesting. Phenological differences in Europe are discussed with the aid of a table showing dates of beginning of grain sowing and harvesting and duration of vegetation period at different points in west to east Europe and north to south Europe. Two maps showing the length of vegetation periods in Europe and a phenological world map are presented. *Subject Headings:* **1. Phenological climatology 2. Plant phenology 3. Luhtenfels, Western Germany.**—*I.L.D.*

INSTRUMENT CARRIERS

See also: **Pilot balloon obs.** (Mikhel'), 11.9–11; **Balloon trajectories** (Giles, Peterson), 11.9–288.

11.9–198 551.507.321:551.508.953:551.521.18

Murcray, David G.; Brooks, James N.; Murcray, Frank H. et al., **Instrumentation for balloon-borne infrared spectral transmission measurements of the atmosphere.** Denver. University. Dept. of Physics, Contract AF 19(604)-2069, Scientific Report, No. 3, Feb. 8, 1960. 12 p. 10 figs. (includ. photo), plate, 5 refs.—Balloon-borne instrumentation for recording atmospheric absorptions of the near infrared from 1μ to 15μ is described and the performance of this equipment on several flights is discussed. *Subject Headings:* **1. Balloon-borne spectrometers 2. Infrared radiation measurement techniques. I. Williams, Walter J. II. Leslie, Frank E.**—*Authors' abstract.*

11.9–199 551.507.321:551.508.953:551.571.7:535.33

Murcray, David G.; Murcray, Frank H.; Williams, Walter J. et al., **A study of the 1.4μ, 1.9μ and 6.3μ water vapor bands at high altitudes.** Denver. Univ. Dept. of Physics, Contract AF 19(604)-2069, Scientific Report, No. 4, Feb. 18, 1960. 11 p. 12 figs., 2 tables, 8 refs., eqs.—On March 13, 1959, the infrared solar spectrum from 1 to 10μ was recorded at altitudes up to 90,000 ft by means of a balloon-borne spectrometer flown in conjunction with a biaxial pointing control. The amount of water vapor present at these altitudes was also measured by means of a frost point hygrometer. Infrared absorptions depend not only on the amount of absorbing material traversed by the radiation but also on its pressure environment. Various methods have been advanced for predicting the absorption that would be suffered by radiation traversing a slant path in the atmosphere. Carpenter et al. have shown that the absorption should be equivalent to that suffered by radiation traversing a constant pressure path through an amount of absorbing gas given by

$$u_e = \int_{h1}^{h2} \frac{a(h)}{a_s} P(h)dh.$$

Kinetic theory predicts that neglecting temperature effects

$$a = \frac{P}{P_S} a_s. \qquad \text{Thus} \quad u_e = \int_{h1}^{h2} \frac{P(h)}{P_S} P(h)dh$$

which is equivalent to that predicted by Curtis. The laboratory studies of Howard et al. indicate that for constant pressure paths

$$u_e = \int_0^x \left(\frac{P}{P_S}\right)^k P(x)dx$$

where k varies from band to band. This suggests that $a=(P/Ps)^k a$, and that u_e should be calculated from

$$u_e=\int_{h1}^{h2}\left(\frac{P(h)}{Ps}\right)^k P(h)dh$$

The absorptions were calculated for the 1.4μ, 1.9μ and 6.3μ bands using both expressions, the hydrometer data and the laboratory data of Howard et al. Comparison of the calculated and observed absorptions indicates that the expression using

$$u_e=\int_{h1}^{h2}\left(\frac{P}{Ps}\right)^k Pdh$$

gives better agreement with the observed values. *Subject Headings:* **1. Balloon-borne spectrometers 2. Infrared radiation measurement techniques 3. Water vapor spectroscopy. I. Leslie, Frank E.**—*Authors' abstract.*

11.9–200 551.507.321.2:551.508.822

Antipov, V. P. and Loginov, N. F., **Metod rascheta vysoty pod"ema radiozondov s uchetom prochnosti obolochek pri nizkikh temperaturakh.** [Method of computing the height of ascent of radiosondes with consideration of the strength of the balloons at low temperatures.] *Meteorologiia i Gidrologiia*, Leningrad, No. 7:11–17, July **1958.** 2 figs., 2 tables, ref., 11 eqs. **DWB, DLC**—A method for computing the height of ascent of radiosondes taking into consideration the strength of the balloons is developed. The equation for the variation of the force of ascent, ϕ, of a balloon with height is devised and is given as

$$\phi=U_1 f_1\frac{P_1T_g}{P_0T}\frac{P}{P+\Delta P}\frac{1-\frac{\gamma_{0r}}{f_0}\left(\frac{P+\Delta P}{P}\frac{T}{T_g}-1\right)}{1-\frac{\gamma_{0r}}{f_0}\frac{\Delta P_1}{P_0}}$$

when the index 1 refers to the magnitude of the gas at the surface of the earth, U = volume of gas, f_1 = initial ascending force, P = atmospheric pressure, ΔP = upward pressure, T_g = gas temperature, T = atmospheric temperature. $P/P+\Delta P$ decreases with height so that during ascent the lifting force of the gas diminishes owing to the increase of relative upward pressure of gas within the balloon. This phenomenon is most evident after the balloon freezes when the inexpanding balloon can still rise. In this case the balloon rises up to the height at which tension of the balloon material reaches the bursting value. This equation contains the value of upward gas pressure in the balloon associated with the tension arising in the material of the balloon, namely σ. For a spherical balloon $\sigma=\Delta P_1 R_1/2\delta_1$ Where R_1 = radius of filled balloon and δ_1 = thickness of balloon film at the earth's surface. The expression $P/P-\Delta P=1-A\sigma$ is observed when $A=2\delta_0 R_0{}^2T_1/R_1{}^3P_1T_g$. For a given elevation $H(P_1T)$ the radius of the balloon is determined for the assumption that upward pressure in the balloon is $R_1=R_1\sqrt{\frac{P_1}{P}\frac{T_g}{T_1}}$; from R_1 the relative stretching $\Sigma_1=(R_1/R_0)-1$ is determined. The upward pressure is computed in the first approximation

$$\Delta P_1=\frac{P}{(1/A\sigma_1)-1}\qquad\text{and}\qquad R_{11}=R_1\sqrt{\frac{P_1}{P+\Delta P_1}\frac{T_g}{T_1}}$$

and so on. Examples of computation of the heights of ascents of radiosonde balloons are presented. It is concluded that the ascent properties of radiosondes are determined primarily by the elastic properties of latex balloons at low temperatures. *Subject Headings:* **1. Radiosonde ascension rates 2. Balloon height maxima.**—*I.L.D.*

11.9–201 551.507.321.2:522.2:523.79

Schwarzschild, Martin and Schwarzschild, Barbara, **Balloon astronomy.** *Scientific American*, N. Y., 200(5):52–59, May **1959.** 9 photos. **DWB, DLC**—Some remarkably sharp

photographs of the sun made with a telescope lifted 82,000 ft are an example of how astronomy can be advanced by means of observations from balloons, rockets and artificial satellites. This article deals with the first experiments with the balloon which were made on Sept. 16, 1957 and the information it produced. *Subject Headings:* **1. Balloon-borne telescopes 2. Solar photography.**—*N.N.* Ⓢ

11.9–202 551.507.362.1:621.396.6

Henry, Dennis G., **400 Mc/sec cutoff notch antenna Aerobee Hi.** New Mexico. State Univ. Physical Science Lab., Univ. Park, N. M. Contract AF 19(604)-2188, Scientific Report No. 4, March 2, **1960.** 24 p. 16 figs. (incl. photos).—This report gives the characteristics of the 400 Mc range Command Control Notch Antenna for the Aerobee Hi. This antenna is to be modified from the 54.5 Mc notch antenna. A detailed study of the radiation pattern was conducted to see what effect the modification had. A bandwidth check was also made. The physical dimensions of the modified antenna are given and compared to the original 54.5 Mc notch. These changes are shown in the included photographs. *Subject Headings:* **1. Aerobee Hi rockets 2. Antenna for rockets.**—*Author's abstract.*

INSTRUMENTS

See also: **Hygrometry texts** (Usol'tsev), 11.9–12; **Infrared spectroscopy** (Lecomte), 11.9–14; **Balloon study of upper atmos. radiation** (Winckler), 11.9–23; **Auroral spectrographs** (Clark, Romick), 11.9–129; **Bathometers** (Ragozhkin), 11.9–174; **Current velocity instruments** (Rymsha), 11.9–175; **Cox salinometers** (Sabinin), 11.9–176; **Current meters** (Savur), 11.9–177; **Balloon-borne spectrometers** (Murcray et al.), 11.9–198; **Balloon-borne spectrometers** (Murcray et al.), 11.9–199; **Radiosonde ascension rates** (Antipov, Loginov), 11.9–200; **F-type (Indian) radiosondes** (Venkiteshwaran, Huddar), 11.9–285; **Light transmission instruments** (Arnulf et al.), 11.9–333.

11.9–203 551.508.21/25:001.4

Georgi, J., **Einheitliche Bezeichnung der met. Strahlungs-Instrumente.** [Standard terminology for meteorological radiation instruments.] *Germany. Deutscher Wetterdienst. Instrumentenamt Hamburg, Technische Mitteilungen des Instrumentenwesens*, n.s., No. 3:25–28, **1957.** table.—The author presents a table giving the type of radiation instrument, the manner and object of measurement and the wave length region measured, and discusses the systemization of the names of instruments used to measure radiation and a classification of the names of the instruments in relation to what aspects of radiation they actually measure. *Subject Headings:* **1. Radiation instruments 2. Radiation measurement techniques 3. Radiation instrument terminology.**—*I.L.D.*

11.9–204 551.508.21 551.521.32

Fleischer, Richard (*Hamburg*), **Die atmosphärische Gegenstrahlung.** [Atmospheric counterradiation.] *Annalen der Meteorologie, Medizin-Meteorologische Hefte*, Hamburg, No. 13:142–148, **1958.** 5 figs., table, 10 refs. **DWB**—The author describes, with the aid of a photograph and a diagram, the structure and operation of the Schulze balance meter which is used at the Hamburg Meteorological Observatory to measure the counterradiation of the atmosphere and discusses in detail the daily variation of counterradiation of a radiation day, the variation of counterradiation on a day with variable radiation, the annual variation of counterradiation for the year 1954–1955, and the semi-annual distribution and monthly distribution of counterradiation for 1956. Also the monthly totals of kcal/cm² of counterradiation and of the atmosphere, of the earth's surface and the global radiation were computed for 1954, 1955 and 1956. The atmosphere counter-radiates both by day and night; atmospheric counterradiation is generally smaller than that of the earth's surface; atmospheric counterradiation can equal the counterradiation of the earth when the sky is fully covered with thick clouds and the temperature of the bottom margin of the clouds equals the radiation temperature of the earth during persistent rain and during fog. Atmospheric counterradiation can exceed the counterradiation of the earth for short intervals when the temperature of the bottom cloud margins is somewhat higher than the radiation temperature of the earth and,

finally, atmospheric counterradiation diminishes with decreasing air temperature and cloud cover. *Subject Headings:* **1. Atmospheric counterradiation 2. Schulze balance meter 3. Radiation measurements 4. Hamburg, Germany.**—*I.L.D.*

11.9–205 551.508.21

Sauberer, F. (*Vienna*), **Ein Schlagbügel-Robitzsch-Pyranograph.** [Point recorder-type Robitzsch pyranograph.] *Wetter und Leben*, Vienna, 10(5/7):94–95, **1958.** 2 figs., ref. **DLC**—The author describes the construction and properties of a mechanical point recorder type pyranograph which, in contrast to electric radiation recorders, is uninfluenced by atmospheric electrical phenomena. It resembles the Robitzsch apparatus except that the pen of the writing lever is replaced by a point recorder. The pointer is freely movable without friction from the pen and at definite intervals it is pressed upon a colored tape stretched across a paper strip. The recording corresponds to that of a point writer in which the electrical measuring system is replaced by a bimetal system. Sensitivity is increased through the frictionless operation of the writing lever. The general temperature effect is eliminated by the corresponding installation of the position of the lever proceeding from the middle (black) bi-metallic strip. The new recording device shows constant zero point. A photograph of the apparatus and a comparison of the record made by a star pyranograph and the point recorder pyranograph are presented. *Subject Headings:* **1. Robitzsch pyranograph 2. Point recorder pyranograph.** —*I.L.D.*

11.9–206 551.508.22

Suomi, V. E. and Businger, J. A. (*both, Univ. of Wisc.*); Kuhn, P. M. (*U. S. W. B.*) and Gergen, J. L., **Note on radiative divergence as determined by the "black ball."** *Journal of Meteorology*, Boston, 15(4):411–416, Aug. **1958.** 4 figs., table, 9 refs., eqs. **DWB, DLC** – Recently GERGEN has published several reports and an article in the *Journal of Meteorology* on infrared radiation measurements with the so-called "black ball." There is no doubt that the black ball is an excellent instrument for the measurement of the total radiation throughout the atmosphere and, as such, may provide valuable information on the earth's radiative equilibrium. However, GERGEN's claim that it is possible to estimate the heating or cooling of the atmosphere from the difference in temperature of the black ball and the ambient air is subject to challenge. In addition to several discussions on this point between GERGEN and the authors, BREWER and HOUGHTON also give expression to this challenge in a clear, theoretical argument. Nevertheless, all discussions on this point have failed to bring agreement. Therefore a special experiment was set up at the University of Wisconsin to settle the controversy by providing observational evidence. *Subject Headings:* **1. Black ball 2. Infrared radiation measurement techniques.**—*Authors' abstract.*

11.9–207 551.508.23:53.088(494)

*Bider, M. (*Astr. Met. Anstalt, Basel Univ.*), **Über die Genauigkeit der Registrierungen des Sonnenscheinautographen Campbell-Stokes.** [On the accuracy of automatic records made by Campbell-Stokes sunshine equipment.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 9(2):199–230, **1958.** 7 figs., 14 tables, 26 refs. German, English and French summaries p. 199–200. **DWB, DLC**—After an allusion to the well-known deficiencies of the Campbell-Stokes sunshine recorder, the author discusses the results of simultaneous records which have been carried out at Basel with this apparatus and the heliochronograph of MAURER. He studies the consequences of their unequal sensibilities with regard to the sun's elevation of the beginning of the registration, the loss of sunshine duration on cloudless days and the daily variation of sunshine duration for the intensities between 0.2 and 0.4 cal cm^{-2} min^{-1}. The errors arising from an excessive burning and their consequences for the total duration of sunshine and for its daily variation are discussed as well as for the number of hours with uninterrupted insolation. The study of the frequency distribution of hours with a determined duration of sunshine, of days with determined totals of insolation, of the sum of relative insolation and cloudiness induces the author to advocate an international normalization of instruments and of evaluation methods. *Subject Headings:* **1. Campbell-Stokes sunshine recorders 2. Instrument accuracy 3. Basel, Switzerland.**—*Author's abstract.*

11.9–208 551.508.25 535.568.1

Besse, André and Desvignes, François, **Polariscope pour l'infrarouge.** [Polariscope for infrared.] *Revue d'Optique*, Paris, 38(7):344–348, July **1959.** 4 figs., 2 refs. **DLC**—Statement of the working principle and description of the principal parts of a polarimeter designed for studying the infrared. The optical properties of the germanium or silicon monocrystalline plaquettes receive special attention. The properties of the instrument depend to a great extent on the quality of the monocrystal used. *Subject Headings:* **1. Polarimeters 2. Infrared radiation measurement techniques.**—*A. V.*

11.9–209 551.508.25:551.521.17

Shelkova-Dorf, O. P.; Skhlover, D. A. (*both, Vsesoiuznyĭ Svetotekhnicheskiĭ Inst.*) and Iakovleva, I. F. (*Evpatoriĭskaia Bioklimaticheskaia Stantsiia*), **Opyt izmereniia estestvennogo ul'trafioletovogo izlucheniia.** [Attempt at measuring natural ultraviolet radiation.] *Svetotekhnika*, Moscow, 4(11):20–23, Nov. **1958.** 4 figs., 5 refs., 6 eqs. **DLC**—During the summer of 1957 total and diffuse UV radiation was measured at the Evpatoriia Bioclimatic Station by means of a recording photoelectric instrument. Problems of instrument calibration, correction for orientation, zenith angle, sun's position, etc. are discussed. A sample curve showing daily variations of total direct and diffuse UV radiation on July 26, 1957 is presented. *Subject Headings:* **1. Ultraviolet radiation measurement techniques 2. Instrument calibration 3. U.S.S.R.**

11.9–210 551.508.71 551.510.62

Sargent, Jack (*NBS, Wash. D. C.*), **Recording microwave hygrometer.** *Review of Scientific Instruments*, N. Y., 30(5):348–355, May **1959.** 3 figs., 13 refs., 11 eqs. **DWB, DLC**—A description is given of a microwave refractometer designed to measure and record the water vapor pressure in a moving air stream, particularly at very low vapor pressures. The instrument has a sensitivity of 0.004 mm Hg with a four decade range extending to 71.3 mm Hg vapor pressure. By means of microwave techniques the difference in refractive index between dry and humid air is determined and then converted to vapor pressure by an empirical formula. The instrument can be readily calibrated by the use of pure gases whose dielectric constants are precisely known. Because of the automatic null-balancing technique used, the instrument has excellent calibration stability. Test results involving the measurement of known vapor pressures in the ranges of 0 to 0.15 mm Hg and 0 to 15 mm Hg are described. Possible applications of this instrument for the measurement of refractive index variation and its use for quality control are briefly discussed. *Subject Headings:* **1. Microwave hygrometers 2. Refractive index.**—*Author's abstract.*

11.9–211 551.508.824:551.55(52)

Sanuki, M., **Japanese automatic wind station.** *World Meteorological Organization, WMO Bulletin*, 8(2):73–74, April **1959.** photo. **DWB**—For 6 yrs the Japan Met. Agency has operated a net of 188 automatic rainfall stations, with 10 relay and 109 receiving stations. It is now developing a net of automatic wind stations along the Japanese coasts, the first of which went into operation successfully in August 1958 on Nushima, a small island in the channel south of Osaka where 110 passengers drowned when a ferry sank during a sudden gale. Hourly wind speed (5 min average) and direction signals are transmitted at 414 Mc/sec to Tokushima and Wakayama (30–35 km) with a 0.5 watt output. A contact rotating anemometer and wind vane combined control the switches and a magnetic memory resistance unit allows prevailing wind direction for 5 min. to be coded and transmitted. Time keeping and recording equipment are also described, and a picture of the Nushima station and mast with anemometer and wind vane is included. Range of equipment is >50 km. *Subject Headings:* **1. Automatic wind stations 2. Nushima Island, Japan.**—*M.R.*

11.9–212 551.508.92:535.345:551.463

Sauberer, F., **Zur Durchsichtigkeitsmessung in Gewässern.** [Transparency measurement in waters.] *Wetter und Leben*, Vienna, 10(3/4):67–69, **1958.** fig., 6 refs. **DLC**—Various methods for measuring the transparency of water are described and their deficiencies are

summarized. These methods include the measurement of the reach of artificial light sources in water; method of H. PETTERSON, which involves the use of a transparency meter; the transparency meter of L. V. WHITNEY and of F. SAUFERER; and the transparency meter developed by J. JOSEPH, which permitted measurements during daylight. A detailed description is given of the construction of a limnological transparency meter developed at the Zentralanstalt für Meteorologie in Vienna. It consists of a rail upon which the lamp and photoelectric cell housing are attached so that they can be moved at any distance up to one meter and of a six volt lamp producing a point light which can be made parallel by a lense system (biconcave 18 dioptr.+biconcave 12 dioptr.). The lense system enables an even illumination of the cross section of the bundle of light rays so that on proper arrangement of the lamp during variations in the distance of lamp housing-photocell housing the current obtained with the photocell remains constant. The bundle of light ray is sufficiently parallel so that with this apparatus absolute relationships are secured with values measured in the air. The transparency meter is attached to a switch box by means of a 4-ply cable. This contains the microammeter which can be connected either directly or by means of a transistor amplifier to the photocell element. *Subject Headings:* **1. Transparency of water 2. Transparency meters.**—*I.L.D.*

11.9–213 551.508.98:551.586:63:551.584.61

†King, Erwin, **Ein thermo-elektrisch geregeltes Frigorimeter zur wirkungsbezogenen Messung der meteorologischen Umweltbedingungen in der Landwirtschaft.** [A thermoelectric controlled frigorimeter for effective correlative measurements of environmental meteorological conditions in agriculture.] *Germany. Deutscher Wetterdienst, Berichte,* 8(56), **1959.** 31 p. 26 figs. (incl. photos), 8 tables, 98 refs., 30 eqs. English and German summaries p. 3. **DWB**—In order to investigate the influence of the different meteorological elements on the complex factor "heat," two Davos frigorimeters with varying radiation properties ("Strahlungszahl," radiation index) were used. Two additional amplifiers controlled by thermistors are mounted in the coating of the bulb in order to allow for a continuous recording of the cooling power. Having determined the radiation indices and the wind function of the frigorimeter bulbs, the meteorological factors can be indicated (temperature, wind, radiation) which decisively influence the cooling power. The measurements carried out by means of the frigorimeter device on a trial basis in stables are in good harmony with the results hitherto obtained for the single thermic components. Particularly the exchange of long wave radiation can well be observed. It may be assumed that the device can likewise be used in the special field of plant ecology to give an insight in the relations to their surroundings with respect to long wave radiation exchange. *Subject Headings:* **1. Davos frigorimeters 2. Environmental influences on crops.**—*Author's abstract.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Conf. on forecasting** (Schaefer), 11.9–33; **Forecasting vorticity** (Robert), 11.9–38; **Frost protection of citrus orchards** (Saturn), 11.9–44; **Potato blight forecasting** (Pejml), 11.9–45; **Sunspots and weather** (Baur), 11.9–80; **Oceanog. weather stations** (Ovsiannikov), 11.9–173; **Forecasting by pulse soundings** (Gherzi), 11.9–242; **Fog frequency, Paris** (Fontaine, Coudret), 11.9–305.

11.9–214 551.509.2:551.547.3:551.524.72

*Teweles, Sidney and Finger, Frederick G., **Contours and isotherms at 10 millibars July 1957 to June 1958.** Wash., D. C., U. S. Weather Bureau, July **1958.** p. 2–4. 12 charts. Note: This report was prepared for the U. S. National Committee for the International Geophysical Year by the Office of Meteorological Research of the U. S. Weather Bureau for the Fifth General Assembly of CSAGI at Moscow, 30 July to 9 Aug. 1958. **DWB** (M09.317 U587co)—This report outlines the contours and isotherms at 10 mb, July 1957 to June 1958, giving the source of data, the accuracies of data, diurnal effects and the seasonal variations. Also presents suggestions on how to improve the analyses of contours and isotherms. *Subject Headings:* **1. Upper air pressure charts 2. Isothermal charts.**—*N.N.*

11.9–215 551.509.311:551.511.3:551.515.8

Ball, F. K. (*C.S.I.R.O., Div. of Met. Physics, Aspendale, Victoria, Australia*), **A theory of fronts in relation to surface stress.** *Royal Meteorological Society, Quarterly Journal*, 86(367): 51–66, Jan. **1960.** 11 figs., 2 tables, 11 refs., 31 eqs. **DWB, DLC**—Surface-stress terms are introduced into the equations governing the motion of the cold air ahead of a warm front or behind a cold front. Solutions for the steady state indicate that a katafront inversion tends to become horizontal at increasing distances from the front whereas an anafront inversion may continue to slope upwards indefinitely. The depth of cold air will, when the upper flow is curved cyclonically, actually decrease with increasing distance from a cold katafront. It is also shown that the existence of a sharp surface warm front depends on the sudden breakdown of a trailing layer of cold air. The thickness of this layer increases with decrease in latitude and as a result, sharp warm fronts are unlikely to occur at low latitudes. The conclusions concerning cold fronts are in broad agreement with SANSOM's (1951) observations. *Subject Headings:* **1. Frontal analysis 2. Inversion effects on frontal structure.**—*Author's summary.*

11.9–216 551.509.311:551.515.11

Snopkowski, Edward L. and Welch, Paul R. (*both, U. S. Naval Postgrad. School, Monterey, Calif.*), **Evaluation of an objective method for the prediction of central pressures of North Pacific cyclones.** *American Meteorological Society, Bulletin*, 40(7):336–339, July **1959.** 4 figs., 8 tables, 2 refs. **DWB, DLC**—The U. S. Navy's Project-AROWA method of forecasting 24-hr deepening of North Atlantic surface cyclones is applied, with modifications, to the North Pacific for both winter and summer. As in the North Atlantic study, the method successfully separates deepening from nondeepening cases about 90% of the time. Comparison of the forecast and observed values of deepening is also presented. *Subject Headings:* **1. Cyclone deepening forecasting 2. Objective forecasting techniques 3. North Pacific.**—*Authors' abstract.*

11.9–217 551.509.312:551.513.1:551.511.3

Monin, A. S. and Obukhov, A. M. (*both, Inst. Physics of Atmosphere, Acad. of Sci., U.S.S.R.*), **A note on general classification of motions in a baroclinic atmosphere.** *Tellus*, Stockholm, 11(2):159–162, May **1959.** 6 refs., 13 eqs. Russian summary p. 159. **DWB, DLC**—In the present note we make an attempt to classify the basic types of dynamic processes in the atmosphere such as gravitational and acoustic waves and horizontal eddy motions by solving the problem of small oscillations in the baroclinic atmosphere. We have found a certain invariant with the help of which one can estimate the final stationary state of the atmosphere under arbitrary conditions without the analysis of the wave processes which cause the field change. The most natural way of obtaining the special equations for numerical forecasting is that of computing the first derivative in time of the invariant in the second approximation (quadratic terms being taken into account). The filtrating role of the quasi-static approximation is investigated in the note. Quasi-static approximation filtrates the internal acoustic waves and somewhat increases the frequencies of the gravitational waves. It has, in particular, been shown that the time required for establishing the quasi-static balance in the atmosphere is equal to some minutes. *Subject Headings:* **1. Baroclinic atmosphere 2. Dynamics of the atmosphere 3. Numerical forecasting.**—*Authors' abstract.*

11.9–218 551.509.312:551.547

Sedláček, Miroslav, **Predskazanie absoliutnoĭ topografii 1000 mb graficheskim metodom.** [Forecast of the absolute topography of 1000 mb by the graphical method.] *Studia Geophysica et Geodaetica*, Prague, 3(2):165–176, **1959.** 10 figs., table, 3 refs., 2 eqs. English summary p. 176. **DWB**—The results are given of three forecasts of the absolute topography of 1000 mb by graphically solving Eq. (2). Central Europe was the area of forecasts and they were made on Dec. 14, 15 and 16, 1957. They were verified both from the synoptic point of view and by the statistical quantities given in Table 1. The discrepancy between forecasts and the actual observations is considered; points of greater discrepancy are shown and causes of the inaccuracy of the forecasts are determined. *Subject Headings:* **1. Graphical forecasting models 2. Absolute topography 3. Forecast verification.**—*I.S.*

11.9–219 551.509.312:551.547

Škoda, Miroslav (*Met. Inst., Charles Univ. Prague*), **Graphical forecasting of absolute topography 50 cb by means of Sawyer-Bushby baroclinic model.** *Studia Geophysica et Geodaetica*, Prague, 2(3):280–290, **1958.** 8 figs., table, 5 refs., 17 eqs. Russian summary p. 290. **DWB**—This paper deals with the graphical integration of a baroclinic model for forecasting 500 mb absolute topography. Results obtained with this graphical method are compared with those obtained by numerical integration of the same model, and also with those obtained from a barotropic model. Results of the graphical and numerical integrations of the baroclinic model appear to be of comparable quality. It is also found that although the baroclinic model is theoretically superior to the barotropic one it does not yield better results. *Subject Headings:* **1. Graphical forecasting models 2. Absolute topography 3. Baroclinic models.**—*G.T.*

11.9–220 551.509.313:551.509.314

Fujita, T. (*Met. Res. Inst., Tokyo*), **Periodicities and latitudinal interactions of mean zonal flow on the 5-day mean 500-mb surface.** *Papers in Meteorology and Geophysics*, Tokyo, 9(3/4):131–140, Jan. **1959.** 6 figs., table, 6 refs., eqs. Japanese summary p. 140. **DWB**—The nature of variation of mean zonal wind for the 500 mb surface was investigated for two winters. The well-defined southerly trends of ΔU were frequently observed, and consequently they also influenced the cross correlation of ΔU between a particular latitude and the others. The periodicity of about 25-days was found in middle latitudes and it coincided with the mean period which was calculated from a dynamical theory of mean zonal wind. *Subject Headings:* **1. 500 mb flow patterns 2. Zonal wind periodicities.**—*Author's abstract.*

11.9–221 551.509.313:551.524.4:551.525.4

†Stevens, Donald W., **Numerical experiments in forecasting air and soil temperature profiles.** *U. S. Air Force Cambridge Research Center, GRD Research Notes*, No. 12, July **1959.** 65 p. 19 figs., 4 tables, 32 refs., 31 eqs. **DWB**—A numerical forecasting model based on Taylor's heat-transfer equation for the atmosphere and the classical heat-conduction equation for the soil is presented. The surface energy-budget equation is solved for the surface temperature, and the equations are integrated numerically to provide 4-hr forecasts of the temperature profiles in the soil and atmosphere. Five experiments using different functional forms for eddy conductivity are described, and the results are compared with observations. The last experiment showed reasonably good agreement between the forecast and observed temperatures, the maximum error being 1.6°K. The model constants producing this result are not unreasonable in the light of present knowledge of the magnitude and vertical variation of the eddy conductivity. The shortcomings of the model are discussed, and some plans for further testing are listed. Suggestions for improving the model are presented, and a brief discussion of the potentialities of an analogue computer for solving problems of this type is given. *Subject Headings:* **1. Numerical forecasting models 2. Temperature profiles.**—*Author's abstract.*

11.9–222 551.509.313:551.515.4

Tkachenko, A. V., **Ispol'zovanie metoda sloia dlia prognoza konvektivnoĭ oblachenosti livneĭ i groz.** [Use of the layer method for forecasting convective clouds, showers and thunderstorms.] *Meteorologiia i Gidrologiia*, Leningrad, 9:24–27, Sept. **1958.** fig., 9 refs., 6 eqs. **DWB, DLC**—The relationship between vertical thickness of convective clouds and the dimension of the area occupied by them provides a basis for a method of forecasting convective clouds, showers and thunderstorms. The conditions of vertical atmospheric stability for moist adiabatic ascent in a dry adiabatic medium are expressed by the criterion $S_b \gtrless \mu$ where S_b = so called "amount of convective clouds" and $\mu = \gamma - \gamma_m/\gamma_d - \gamma_m$ where γ = actual temperature gradient, γ_m = moist adiabatic and γ_d = dry adiabatic gradient. If the moist adiabatic parcel of air rises to height h from the level of condensation the equation $\mu(h) = \dfrac{T_m(h) - T(h)}{T_m(h) - T_d(h)}$ is obtained. The computation of $\mu(h)$ with data obtained by means of an emagram is illustrated. If the criterion $S_b \gtrless \mu$ is applied to air parcels at the upper boundary of a cloud then it is possible to state that the given height h (above the condensation level) can be reached

only when the values S_b do not exceed $\mu(h)$; when $S_b=\mu(h)$ the upper level of the cloud is established at h; when $S_b<\mu(h)$ the cloud will continue to grow. This relationship between S_b and $\mu(h)$ can be used in forecasting convection. The term S_b is not the actually observed cloud amount (n) but rather $S_b=S_w-S_m+S_s$ when S_w = total area of the horizontal section of ascending currents of moist saturated air, S_s = corresponding value for compensating descending currents of dry adiabatic air forming a clear space and $n=\omega/2\pi$ where π = total solid angle under which clouds are observed, if the entire visible sky is estimated as 2π stereoradians. Also S_b can be considered as the proportion of an area with uniform conditions of convection occupied by clouds with a vertical thickness h. Examples of forecasting thunderstorms and showers are presented. *Subject Headings:* **1. Thunderstorm forecasting 2. Convective clouds.** —*I.L.D.*

11.9–223 551.509.314

*†Shorr, Bernard (*ed.*), **Studies in statistical weather prediction.** Travelers Weather Research Center, Contract AF 19(604)-1590, Final Report, Dec. 31, 1958. 238 p. figs., tables, 48 refs., eqs. Contents: Friedman, Don G., **Time series analysis and Ogawara's general prediction formula,** p. 5–85. Miller, Robert G., **A statistical procedure for screening predictors in multiple regression,** p. 86–95. Miller, Robert G., **A computer program for the screening procedure,** p. 96–136. Miller, Robert G., **Statistics and the predictability of weather,** p. 137–153. Veigas, Keith W.; Miller, Robert G. and Howe, George M., **Probabilistic prediction of hurricane movements by synoptic climatology,** p. 154–202. Miller, Robert G. and Howe, George M., **Statistical prediction of the 500 mb pattern,** p. 203–215. Miller, Robert G., **Preparation of surface weather station data,** p. 216–231. Bibliography, p. 232–236. (These articles not abstracted separately.) –The first paper is a review of the "Time series analysis" and the "General prediction formula" presented in 1955 by OGAWARA with a brief examination of some aspects of the theory and a comparison of the measure of uncertainty in the "time series prediction" with the measures now in use. The second discusses the applicable statistical methods to solving the various weather prediction problems and also describes the operation of the binary program, which was used in an investigation of the predictability of certain weather elements. A test of the hypothesis that the circulation pattern of hurricane contains significant information over and above its past position is given. This is an aid in determining the subsequent positions of such hurricanes. The results of the statistical prediction of 500 mb patterns are also presented. The last paper describes and discusses the methods that should be used in editing and correcting all the basic data for the 14 weather types and the specifications for the data tapes. *Subject Headings:* **1. Statistical weather forecasting 2. Time series analysis 3. Hurricane movement forecasting 4. 500 mb flow patterns 5. Forecast verification.**—*N.N.*

11.9–224 551.509.317

Bukhov, E. D., **Analiz i prognoz pogody metodom nalozheniia karty tropopauzy na kartu AT 300.** [Weather analysis and forecasting by superposition of a tropopause chart on a 300 mb chart.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:51, April 1959. **DWB, DLC**— In order to investigate the waves formed at the separation of the air masses of different density in related movement, the author superposed the tropopause chart upon the 300 mb chart. It was found that in those regions where the isohypses of the tropopause chart intersect with the 300 mb isohypses on surface chart, centers of cyclones and wave disturbances appear and also a change in the sign of the front is observed. This is observed also in places where the isohypses are parallel but the currents are opposite. If the tropopause is above the 200 mb surface the tropopause map is placed upon the 300 mb chart. When the lower boundary of the tropopause lies below the 300 mb layer the tropopause map is placed upon the 400 mb chart. This rule discloses the existence of wave disturbances in their initial stages and also tropospheric waves. By forecasting the future position of the isohypse upon the tropopause maps and the 300 mb surface it is possible to determine the future behavior of cyclones and waves. If previously isohypses intersected and then became parallel then the cyclones and waves will subside; if the isohypses will intersect then disturbances will arise. If the isohypses of two surfaces become parallel and the inflow of both surfaces will have the same direction then a field with a weak gradient forms at the surface of the earth and the wind subsides. The

actual method of forecasting the future position of an isohypse upon a tropopause chart and upon a 300 mb surface (400, 300 mb) by using tracing paper or celluloid is outlined. *Subject Headings:* **1. Tropopause analysis 2. Tropopause—300 mb chart relationships 3. Synoptic forecasting.**—*I.L.D.*

11.9–225 551.509.317:551.509.21 551.509.33:551.515.71(57)

Rafailova, Kh. Kh., **Ob usloviiakh obrazovaniia taĭmysrkogo maksimuma.** [Conditions for the formation of the Taimyr high.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:10–16, **1958.** 3 figs., 2 tables. **DWB, DLC**—The properties of the daily 500–1000 mb anomaly charts are summarized, in particular their clear indication of the regions of anomalous stores of heat and cold, which correspond to the centers of anomaly, and also the regions of greatest heterogeneity of air masses corresponding to the transitional zones between centers, i.e., regions of zero iso-anomalies. Such daily anomaly charts are used to determine the conditions attending the formation of the Taimyr maximum. Analysis of 67 anticyclones showed the following: by the use of daily 500–1000 mb anomaly charts it is possible to forecast 3–4 days in 77.5% of the cases the formation of a high, slowly moving anticyclone over the Taimyr Peninsula. The distribution of positive anomaly centers 2–5 days before the formation of the Taimyr maximum indicates that the movement of anomaly centers, associated with the transport of heat to the Barents Sea region, begins from the Norwegian Sea and Scandinavia. Also negative anomaly centers participate in the formation of the maximum, which are found over Siberia or migrated there from the Arctic basin. A detailed analysis is given of the daily anomaly charts for two years (1953 and 1956). These showed that not every transport of heat to the Barents region or the Kara Sea produces an anticyclone over the Taimyr Peninsula. A high anticyclone extending at least to 5 km is formed under conditions when the algebraic difference of the anomaly values in the south and the southeast directions from the center of positive anomalies over the Barents or the Kara Sea allows or exceeds 20 km. *Subject Headings:* **1. Extended forecasting from anomalies 2. Anticyclogenesis 3. Taimyr high 4. Asiatic U.S.S.R.**—*I.L.D.*

11.9–226 551.509.317:551.509.323:551.524.36

Rákóczi, Ferenc, **Kísérlet a hőmérsékleti minimum előrejelzésére a 850/1000 mb-os relatív geopotenciál alapján derült napokon.** [Attempt at forecasting minimum temperature by means of the 850/1000 mb relative geopotential on clear days.] *Időjárás*, Budapest, 62(2):83–89, March/April **1958.** fig., 4 tables, 7 refs., 4 eqs. Hungarian and German summaries p. 83. **DWB, DLC**—A correlation is found between minimum temperature and the 850/1000 mb geopotential for the preceding day. It appears to be sufficiently significant for purposes of general forecasting. The correlation is explained by the fact that the mean temperature of the 850/1000 mb layer has a decisive influence on the strength of the inversion resulting from radiational cooling. *Subject Headings:* **1. Minimum temperature forecasting 2. Geopotential-minimum temperature correlations.**—*G.T.*

11.9–227 551.509.318:551.590.21

Baur, Franz (*Bad Homburg*), **Das Grosswetter unter dem Einfluss von Strahlungsschwankungen der Sonne: Witterungsvoraussage für den Sommer 1959 für West- und Mitteleuropa.** [Large scale weather under the influence of variations in solar radiation: weather forecast for the summer 1959 for Western and Central Europe.] *Naturwissenschaftliche Rundschau*, Stuttgart, 12(6):209–213, June **1959.** fig., 3 tables, 6 refs. **DWB, DLC**—In considering the problem why in different years at the same seasons there appear different forms of the general atmospheric circulation and different, frequently contradictory, weather situations, the author shows that there is no terrestrial explanation of the large weather anomalies. The fundamental terrestrial presuppositions such as total mass and composition of the atmosphere, mean inclination of the ecliptic, excentricity of the path of the earth and distribution of land and water would have become equalized in the course of time. Large scale weather also does not manifest an 11-year cycle either parallel or opposite to the sunspot frequency; nevertheless large scale weather shows other relationships with the sunspot cycle. The weather effective ultraviolet radiation which originates in the photosphere and which is responsible for the high pressure regions in the upper atmospheric levels of the earth does not

escape completely from the most extreme layers of the sun; a seventh of the photospheric radiation is absorbed by the chromosphere and radiated back to the photosphere. This radiation loss presumably also shows an 11-year cycle. When the photospheric radiation attains its maximum, then the maximum emission of weather effective radiation into the cosmos does not coincide with the maximum radiation of the photosphere; instead there appear at least 2 maximas of radiation in the cosmos. This explains the existence of the three frequency peaks of summers with high atmospheric pressure in Edinburgh (1770–1958). At the same place, namely two years before and two years after the sunspot maximum, as well as two years before and after sunspot minimum year, are also the frequencies of summers with high atmospheric pressures over southern North Europe (1816–1958) and the frequency peak of dry summers in Central Europe (1804–1958). A chi-square test shows that the probability of a chance occurrence of such frequency differences is extremely slight. No frequency peak of dry summer after the sunspot maximum is accentuated when one begins with the second summer after the sunspot maximum instead of the second year after the maximum year. This technique is applied to the summer of 1959 and the drought of this summer is shown to conform to the expectation from the sunspot maximum of 1957. It is also shown that the greatest probability for a dry 1959 summer exists for the region Württemberg-Lower Franconia-South Hesse-Baden-North Switzerland. For part of Belgium and southern England the probability of dry summer is greater than 80%. *Subject Headings:* **1. Weather anomalies 2. Large scale weather processes 3. Solar-weather relationships 4. Forecasting from anomalies.**—*I.L.D.*

11.9–228 551.509.318:551.515.827

Khrabrov, Iu. B., **Osnovnye cherty razvitiia sinopticheskikh protsessov v estestvennykh sinopticheskikh periodakh.** [Basic pattern of the development of synoptic processes in natural synoptic periods.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 63:3–19, **1957.** 5 figs., 3 tables, 8 refs., 2 eqs. **DLC**—The basic pattern of the development of synoptic processes within natural synoptic periods and of changes taking place in these processes during the shifting of natural synoptic periods were studied on the basis of observation data of 47 natural synoptic periods from January to Sept. 1956. The investigation carried out by the method of studying the development of the planetary upper frontal zone (PUFZ), a narrow zone of increased horizontal pressure and wind speeds gradients in the middle and upper troposphere, showed that changes of the PUFZ position during a given synoptic process are governed by definite rules which are discussed. An analysis is made of the duration of natural synoptic periods and of large-scale synoptic processes that, in the majority, coincide correctly to ±1 day. *Subject Headings:* **1. Natural synoptic periods 2. Large scale weather processes.** —*A.M.P.*

11.9–229 551.509.318:551.515.827:551.547.5

Khrabrov, Iu. B., **Prognoz tsirkuliatsionnykh usloviĭ odnorodnogo makrosinopticheskogo protsessa.** [Forecasting circulation conditions in a homogeneous large-scale synoptic process.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 63:39–49, **1957.** 4 figs., table, 2 refs. **DLC**—A theoretical paper in which the author introduced a method of disclosing the sections of the planetary upper frontal zone (PUFZ) and upper air pressure formations whose vortical pattern of movement gives prognostic indications of the vortical field (Laplacian field) at the beginning of the following homogeneous synoptic process (natural synoptic period). A joint analysis of data (Laplacian values and height differences) for 51 natural synoptic periods (Jan. 1–Oct. 25, 1956) discloses definite criteria for obtaining indications on the character of the upper air pressure field at the beginning of the ensuing homogeneous process. The reliability of the proposed method proved to be accurate by 85% for regions of cyclonic vorticity, and by 78% for regions of anticyclonic vorticity. *Subject Headings:* **1. Natural synoptic periods 2. Large scale weather processes 3. Planetary upper frontal zone.**—*A.M.P.*

11.9–230 551.509.318:551.524.35/.36(571)

*†Sergeev, N. I., **Sinopticheskie sezony i sezonnye anomalii temperatury vozdukha kholodnogo polugodiia v vostochnoĭ Sibiri.** [Synoptic seasons and seasonal air temperature anomalies during the cold period of the year in western Siberia.] *Sbornik Rabot po Sinoptike*, Moscow, No. 3:93–137, **1959.** 18 figs., 15 tables, charts, 32 refs., eq. **DWB**—The results of

this study, which is based upon meteorological and synoptic data of 1948–1952 of stations in Kuibyshev, Chkalov (Orenburg), Ulyanovsk and Penza Oblasts, indicate the following, viz: the initial cause of frosts in the southeastern European territory of the U.S.S.R. is the advection of cold air from north, northwest and west; in this region frosts are observed primarily in an anticyclonic field at the surface of the earth; they are advective radiational in nature; they usually begin on the second day after the incursion of cold into southeastern European U.S.S.R.; the latest date of occurrence of late spring frost occurs in May and the first decade of June; the first fall frosts are observed primarily during the second decade of September and individual frosts are observed during the first decade of September and third decade of August. Data are presented on the monthly incidence of frosts at Chkalov, Penza and Ulyanovsk stations and on the intensity of the last spring atmospheric frosts and ground frosts in Chkalov Oblast and the dates of their occurrence and the intensity of the first fall frosts at Orenburg oblast and the dates of their occurrence. *Subject Headings:* **1. Temperature anomalies 2. Frost forecasting 3. Western Siberia.**—*Author's conclusions & I.L.D.*

ARTIFICIAL PRECIPITATION

11.9–231 551.509.617

Augustin, H. (*Ingénieur Météor.*), **Les expériences de pluie artificielle effectuées à Madagascar en 1953.** [Experiments on the effectiveness of artificial rain in Madagascar in 1953.] *Pan Indian Ocean Science Congress, Aug. 1954, Perth, Western Australia, Proceedings of Section A, Physical Sciences*, p. 86–87. table, 3 refs. **DWB** (506.35 P187pr)—A method of treating snow in order to create artificial rain had been experimented with in Madagascar during 1953. The effects of the artificial rains are discussed. It is observed that under certain conditions the particles of snow appear able to start heavy rains. A tabulation of the results of the investigation and a list of the data papers are given. *Subject Headings:* **1. Artificial precipitation reports 2. Artificial precipitation techniques 3. Madagascar.**—*N.N.*

11.9–232 551.509.617:551.578.7(44)

Dessens, H., **Les expériences de prévention de la grêle poursuivies en France.** [Experiments on hail prevention in France.] *Simposio Internazionale sulla Fisica delle Nubi e Relative Applicazioni all'Agricoltura, Asti, Italy, April 1958, Atti*, pub. Dec. **1958.** p. 86–90. 10 refs. French, Italian and English summaries p. 90.—Severe hail forms in cumulonimbus clouds containing large quantities of supercooled water and displaying a great vertical development. At present, it is not certain that with ground generators a sufficient density of silver iodide particles can be obtained to prevent supercooling. But observations have shown that it is possible to prevent the extensive vertical development of cumulonimbus clouds. To solve this problem, it is necessary to carry out aerological research over the area to be protected as well as physical studies on the high efficiency production of active nuclei. *Subject Headings:* **1. Hail prevention 2. Cloud seeding with silver iodide 3. France.**—*Author's abstract.*

11.9–233 551.509.617:546.815

†Papée, Henry M. (*Natl. Research Council, Canada*), **On the preparation and sintering of cloud precipitation agents: lead di-iodide microcrystals.** *Canadian Journal of Chemistry*, Ottawa, 36:1443–1448, **1958.** 4 figs., 25 refs. **DLC**—Two experimental processes of sintering lead iodide of relatively large and controlled specific surface areas have been described. These processes are in connection with a microcalorimetric study of heat of adsorption of water vapor on lead iodide surfaces. The report gives the analysis as well as the results of this investigation on water condensation. *Subject Heading:* **1. Cloud seeding with lead di-iodide.**—*N.N.*

11.9–234 551.509.616(252)

Les physiciens de l'atmosphère parviendront-ils à inverser le processus de désertification du Sahara? [Will the physicists of the atmosphere succeed in reversing the drying-up of the Sahara?] *La Technique de l'Eau*, Brussels, 13(150):45–47, June **1959. NN, ICJ**—Summary and comments of a conference by H. Dessens on April 9, 1959 at the Saharian Medico-social Information Days. Two methods are recommended at present to alter weather and to provoke

rain; they are, on the one hand, modification of weather through cloud seeding and on the other hand, energetic action on the forming and evolution of clouds. Two types of cloud seeding are mentioned, and energetic action on the forming and evolution of clouds is investigated. Seeding techniques do not seem to be applicable to the Sahara. Provoked convection (solar overheating or combustion) seems promising. Experiments carried out by H. Dessens in the Belgian Congo have proved the possibility of obtaining rain from large cumuli, artificially formed in a clear sky. Dessens is of the opinion that, with sufficient means at their disposal, it is just possible that the physicists of the atmosphere might succeed in reversing the drying-up of the Sahara. *Subject Headings:* **1. Cloud seeding 2. Artificial convective cloud generation 3. Sahara Desert. I. Dessens, H.**—*A.V.*

11.9–235 551.509.6

Wexler, Harry (*Dir., Met. Research, U. S. W. B.*), **Modifying weather on a large scale.** *Science*, Wash., D. C., 128(3331):1059–1063, Oct. 31, **1958.** 3 figs., 2 tables, 19 refs. **DLC**—Modification of climate and weather on a large scale, subject to change by artificial means of the shape two basic radiation curves—the downward and upward streams of radiant energy from the sun—is discussed. Proposals to change the albedo, reflectivity of deserts and snowfields by blackening them with carbon dust are scrutinized, the extent of effective change assessed, and practical difficulties of logistics, etc. enumerated. Later the alternate possibility of reducing the return of infrared radiation to space by the formation of ice clouds is considered. Manufacture of the ice cloud, its effect on radiation balance and temperature, and meteorological consequences are discussed and graphically explained. It is emphasized that before entertaining any serious proposals for large-scale weather modification, its meteorological consequences, apart from practical considerations, must be given thought "so as to avoid the unhappy situation of the cure being worse than the ailment." *Subject Heading:* **1. Weather modification.**—*I.S.*

11.9–236 551.509.617:546.57:546.15

Tapia Contreras, Jose, **Estimulacion artificial de la lluvia en el nordeste de Marruecos (segunda campana, Oct. 1954–Mayo 1955).** [Artificial stimulation of rain in Northeast Morocco: second season, Oct. 1954–May 1955.] *Spain. Servicio Meteorológico Nacional, Publicaciones, Ser. A.* (*Memorias*), No. 27, **1956.** 53 p. graphs. **DLC**—Experiments with silver iodide seeding in southern Spain and northeast Morocco during March–May 1954 (and earlier tests since Jan. 1953 in the eastern part of the French Protectorate), were continued from Oct. 1954–May 1955, using 18 generators. Day-by-day weather conditions, operations and results are discussed and presented on handsome isohyetal charts (showing relief), and in graphs. Although the presentation is quite complete and the "conclusions" extensive, the only real firm result was the conviction that seeding is more valuable for provoking additional precipitation than for originating precipitation. *Subject Headings:* **1. Artificial precipitation projects 2. Cloud seeding with silver iodide 3. Spanish Morocco.**—*M.R.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

See also: **IGY atmos. ozone program** (Vassy), 11.9–195.

11.9–237 551.510.41:551.510.53:546.33/4

Donahue, T. M. (*Univ. Pitts., Pennsylvania*), **Origin of sodium and lithium in the upper atmosphere.** *Nature*, London, 183(4673):1480–1481, May 23, **1959.** 7 refs. **DWB**—Conclusion of the attempt made to estimate the ratio of free lithium to free sodium is that the ratio is of the order of 0.006 (even 0.02 if ions are considered). Since the nuclear explosion of Aug. 1, 1958 at Johnston Island may well account partially for the lithium observed, the lithium-sodium measurements in solving origin of the atmospheric sodium has become less useful. From available data, the evidence of a marine origin is favored. *Subject Headings:* **1. Sodium in upper atmosphere 2. Lithium in upper atmosphere 3. Atmospheric composition.** *W.N.* ®

ATMOSPHERIC POLLUTION

See also: **Radioactivity in the atmos.** (Pauling et al.), 11.9–55; **Weathering by atmos. pollution** (Munn), 11.9–58; **Pollution problems in nuclear energy production** (Hilst), 11.9–246; **Pollution effects on fog formation** (Fontaine, Coudret), 11.9–305.

11.9–238 551.510.42:546.22:551.588.7(436)

Bangerl, Anna and Steinhauser, Ferdinand (*Inst. f. Met. & Geophysik, Vienna Univ.*), **Die Verteilung des SO_2-Gehaltes der Luft im Stadtgebiet von Wien.** [The distribution of SO_2 content of air in the metropolitan area of Vienna.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 10(1):132–153, **1959.** 4 figs. (incl. photos), 4 tables, 12 refs., 3 eqs. German, English and French summaries p. 132. **DWB, DLC**—During the period September 1956 to September 1957 the amount of SO_2 deposited from the atmosphere was observed at numerous locations in the town of Vienna. The observations were made by means of cotton rags, soaked with an absorbing chemical, and each rag was exposed for four weeks. The amounts of SO_2 show great differences within the area, and a pronounced annual variation, with a maximum in winter and a minimum in July. The influence on the SO_2 content of the air of meteorological factors is discussed in detail, with special regard to variations by orographic conditions and local SO_2 sources. Additional SO_4^{--} determinations on snow samples are reported. *Subject Headings:* **1. Sulphur dioxide in the atmosphere 2. Urban influences 3. Vienna, Austria.**—*Authors' abstract.*

UPPER ATMOSPHERE

See also: **Atmos. effects on cosmic rays** (Trefall), 11.9–117; **Stratospheric radiation** (Ohring), 11.9–267; **Tropospheric winds** (Faust), 11.9–299; 11.9–300.

11.9–239 551.510.5

Arkhangel'skiĭ, V. N. and Sukhotskiĭ, E. I., **Novaia standartnaia atmosfera.** [A new standard atmosphere.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:55–58, **1958.** 3 figs., 2 tables. **DWB, DLC**—The new expanded and more accurate standard atmosphere extending to a height of 300 km, developed in 1956 by the U. S. Weather Bureau and Geophysics Research Directorate of the Air Force, is described. Graphs are presented showing the variation of temperature with height (kinetic and molecular temperatures), the variation of pressure with height according to the new standard atmosphere and according to the tables of NACA 1947 for both day and night, variation of temperature with height for the NACA 1947 and for the new standard atmosphere values of temperature and pressure. The NACA and the new standard atmosphere are compared and the principal characteristics of the tables are described. It is also pointed out that up to a height of 25 km the standard atmosphere coincides with that of the U.S.S.R. (GOST 4402-48). In the 25 to 30 km interval the U. S. standard atmosphere accepts a temperature increase with a gradient of 3 degrees per kilometer while the GOST 4402-48 extends isothermy up to 30 km. Accordingly at 30 km there are considerable differences in temperature, pressure and density values. *Subject Heading:* **1. Standard atmospheres.** —*I.L.D.*

11.9–240 551.510.53:551.594.53

Elvey, C. T. and Sugiura, M. (*comps.*), **Indices of upper atmospheric disturbance phenomena in auroral zone.** Alaska Univ. Geophysical Institute, NSF Grant Y/1.14/177, Scientific Report, No. 2 (on IGY Project No. 1.14), Dec. **1958.** 7 sections, separately paged. fig., table.—The Geophysical Institute, Alaska, has studied the relationships between the disturbance phenomena in the upper atmosphere over polar regions. All sky cameras, spectroscopic and photometric instruments, auroral radars, and radio telescope have been used in the study of cosmic radio noise, absorption, earth currents, ionospheric absorption of cosmic radio noise, spectroscopic and photometric indices. Each of these disciplines is explained in this report briefly. The data were obtained and studied at College, Alaska, during February 1958. *Subject Headings:* **1. Ionospheric disturbances 2. Auroral zone disturbances.**—*N.N.*

IONOSPHERE

See also: **Sec. D2**, p. 1413; **High altitude radiation**, 11.9–4; **Earth's atmos.** (Chapman), 11.9–73; **Sunspot-radio propagation relationships** (Chappell), 11.9–81; **Radio emissions from exosphere** (MacArthur), 11.9–108; **IGY atmos. ozone program** (Vassy), 11.9–195; **Sodium in upper atmos.** (Donahue), 11.9–237.

11.9–241 529.7:551.510.535:551.594.12

Dominici, P., **Un'osservasione sull'andamento annuo dei valori orari di grandezze geofisiche a controllo solare.** [An observation on the annual hourly values of geophysical parameters controlled by the sun.] *Annali di Geofisica*, Rome, 12(3):272–282, July/Sept. 1959. 4 figs., 25 eqs. Italian and English summaries p. 281–282. **DLC**—There is a possibility that behavior of hourly values of geophysical data depending from thez enith distance χ of the Sun may be altered by the fact that these values are computed with reference to the civil time of the observing station and not to the solar time. For the sake of an example, the amount of such "distortion of form," has been calculated for the particular case of the meridian values of the maximum electron density N of a ionospheric layer in which the electronic balance is given by an equation of the following type: $N/t = f(\chi) - BN$. The results obtained in this particular case allow us to think that this effect must be, generally, taken into consideration, especially for medium- and high-latitude stations whose position in their respective time zones is eccentric. *Subject Headings:* **1. Solar-geomagnetic relationships 2. Ionospheric ionization 3. Electron density variations.**—*Author's abstract.* Ⓢ

11.9–242 551.510.535:551.509.3

Gherzi, E. (*Collège J. de Brébeuf, Montreal*), **Ionosphere and surface weather.** *Geofisica Pura e Applicata*, Milan, 44:188–190, Sept./Dec. 1959. 5 refs. **DLC**—The author describes the pulsing ionospheric technique which since 1939 has been successfully employed for forecasting surface weather. *Subject Headings:* **1. Ionospheric sounding techniques 2. Pulse soundings.**—*Author's summary.* Ⓢ

11.9–243 551.510.536:550.38:538.69:532.59

Scholte, J. G. J. (*Royal Netherlands Met. Inst., De Bilt*), **On the theory of giant pulsations.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(4):325–336, Feb. 1960. 2 figs., 3 refs., eqs. **DLC**—The propagation of a magnetoionic disturbance originating in a small region of the exosphere has been investigated; it appears that only a rotational movement perpendicular to the geomagnetic field is propagated without any great loss of energy. The amplitude of a compressional movement perpendicular to this field decreases with increasing distance to the source, whereas a movement parallel to the magnetic field is propagated as a sound-wave without any magnetic effect. Therefore the observed giant pulsations, which are ascribed to standing waves along the lines of force, are mainly caused by the rotational part of the primary disturbance and the properties of these variations are closely connected with the properties of that part of the original movement. *Subject Headings:* **1. Magneto-ionic disturbances 2. Ionospheric disturbances.**—*Author's abstract.* Ⓢ

RADIO METEOROLOGY

See also: **Refractive index variation measurement** (Sargent), 11.9–210.

11.9–244 551.510.62:538.69:532.59

Holter, Øivin, **On the propagation of transverse electromagnetic waves in a plasma in a magnetic field.** *Oslo. Universitet. Instituut for Teoretisk Astrofysikk, Report*, No. 7, June 1959. 62 p. 8 figs., 39 refs., numerous eqs. **DWB**—Boltzmann's equation is the basis for the most general determination of the propagation constants by statistical theory. The rather drastic simplifications necessary make the solution valid for a Lorentz gas only. By assuming a constant collision frequency we obtain the macroscopic approximation, in which a general formula for the refractive index is evaluated explicitly. The latter formula contains the Appleton-Hartree formula and Åström's results as special cases. An investigation of the collision effect on Åström-Ferraro waves gives the limiting velocity equal to zero as the fre-

quency approaches zero. *Subject Headings:* **1. Electromagnetic wave propagation 2. Magnetic field effects 3. Fluid mechanics.**—*Author's abstract.* Ⓢ

11.9–245 551.510.62:550.38:538.3:681.14:621.38 551.510.535:551.594.12

Mechtly, E. A., **A computer program for obtaining refractive indices and polarizations from the Appleton-Hartree equations and magneto-ionic tables for Cape Canaveral.** Pennsylvania. State Univ. Ionosphere Research Lab., Contract DA-36-061-ORD-577, Scientific Report, No. 116, Feb. 15, **1959.** 64 p. figs., tables, 3 refs., eqs. **DWB**—Program Cc 126 for the Pennsylvania State University's digital computer PENNSTAC is given. This program has been prepared for the computation from the Appleton-Hartree equations of magneto-ionic refractive indices and polarizations for both modes of propagation. Instructions for using this program are given. Magneto-ionic tables for Cape Canaveral, Florida are presented. These tables have been compiled for use in conjunction with the Ionosphere Research Laboratory's project for the determination of electron densities in the ionosphere by means of rockets. *Subject Headings:* **1. Ionospheric radio wave refraction 2. Ionospheric polarization 3. Digital computer programs.**—*Author's abstract.*

RADIOACTIVITY

See also: **Sec. B4,** p. 1395.

11.9–246 551.510.721:551.510.42

Hilst, Glenn R. (*Hanford Labs. Operation, General Electric Co., Richland, Wash.*), **Some meteorological problems in nuclear energy production.** *Weatherwise*, Boston, 10(5):158–161 and 174 and 176, Oct. **1957.** 3 photos, eq. **DWB**—The pollution problems, both routine and potential, present at an atomic reactor or nuclear energy plant such as that at Richland, Wash., and the consultation services of meteorologists in design, location, alterations, and operations, are discussed and illustrated. A full time weather service, with a 400 ft tower and round-the-clock professional meteorological duty, issuance of diffusion advisories and a disaster warning service in case something goes wrong. Finally, there is considerable research done in the Atmospheric Physics Operation, with problems of atmospheric diffusion. *Subject Headings:* **1. Nuclear energy plant meteorology stations 2. Hanford, Wash.**—*M.R.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Vorticity forecasting** (Robert), 11.9–38; **Inversion effects on frontal structure** (Ball), 11.9–215; **Baroclinic atmos.** (Monin, Obukhov), 11.9–217; **Energy budget** (Ohring), 11.9–267; **Relative geopotential-temp. relationships** (Rákóczi), 11.9–268; **Heat balance conf.** (Portnov), 11.9–271; **Dynamic analysis** (Keller), 11.9–301.

11.9–247 551.511.2:551.511.6

Hinkelmann, K., **Vorticity, Divergenz und Deformation als kinematische Strömungsbegriffe.** [Vorticity, divergence and deformation as kinematic flow concepts.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 30(1):55–62, **1957.** ref., 2 figs., 16 eqs. German, French and English summaries p. 55. **DWB, DLC**—Vorticity, divergence and deformation are usually defined rather loosely in meteorological usage. This article gives precise mathematical and geometrical definitions for these quantities, which are treated under the headings of: I. invariants of the dyad: (a) the vector of the dyad, (b) the first scalar and (c) the second scalar; II. the velocity dyad: (a) vorticity, (b) divergence, (c) deformation; III. the second scalar, and relation between the invariants. *Subject Headings:* **1. Vorticity 2. Divergence and deformation 3. Dynamic meteorology 4. Vector analysis.** —*M.R.*

11.9–248 551.511.3:551.558

Kohlsche, Kurt, **Beitrag zur Frage der Entstehung von Vertikalbewegungen.** [A contribution on the origin of vertical motions.] *Zeitschrift für Meteorologie*, Berlin, 12(11/12):339–344, Nov./Dec. **1958.** 4 refs., 20 eqs. German summary p. 339. **DWB, DLC**—In order to understand the origin of vertical motion in the atmosphere, the author derives from the third

equation of motion, expressed in spherical polar coordinates, the individual motions according to time in vector form and determines the factors influencing the origin of vertical motions. From the equation

$$\frac{dv_r}{dt} = -\frac{1}{\rho}\frac{\partial p}{\partial r} - \frac{\partial \phi}{\partial r} + 2\Omega \cos \varphi v_\lambda + \frac{1}{r}(v_\lambda^2 + v_\varphi^2)$$

the author demonstrates the derivation of

$$\frac{d^2v_r}{dt^2} = -\left[(\nabla\cdot\mathbf{v})_h + \frac{2v_r}{r}\right]\frac{1}{\rho}\frac{\partial p}{\partial r} + \frac{\varkappa}{\rho}\frac{\partial p}{\partial r}\nabla\cdot\mathbf{v} + \varkappa RT\frac{\partial}{\partial r}(\nabla\cdot\mathbf{v})$$
$$+ \frac{1}{\rho}\frac{\partial \mathbf{v}_h}{\partial r}\cdot\nabla_r p - \frac{1}{C_v}\frac{1}{\rho T}\frac{\partial p}{\partial r}\frac{\partial q}{\partial t} + \frac{1}{C_v}\frac{R}{T}\frac{\partial T}{\partial r}\frac{\partial q}{\partial t} - \frac{R}{C_v}\frac{\partial}{\partial r}\left(\frac{\partial q}{\partial t}\right)$$
$$+ 4\Omega^2 \sin \varphi \cos \varphi v_\varphi' - 4\Omega^2 \cos^2 \varphi v_r - (\mathbf{v}\cdot\nabla\nabla\phi)_v + \frac{3}{r}\left(v_\lambda \frac{dv_\lambda}{dt} + v_\varphi \frac{dv_\varphi}{dt}\right).$$

The essential magnitudes influencing these processes were found to be the divergence and its vertical distribution, the vertical variation of horizontal wind, the geostrophic shear of the north-south component of the wind and the heat sources. *Subject Heading:* **1. Vertical motion theories.**—*Author's summary & I.L.D.*

11.9–249 551.511.3:532.57:536.1

Stern, Melvin E. (*Woods Hole Oceanog. Inst.*), **The moving flame experiment.** *Tellus*, Stockholm, 11(2):175–179, May **1959.** 2 refs., 16 eqs. **DWB, DLC**—When a flame is rotated around the outside bottom rim of a cylindrical pan of water initially at rest, D. Fultz has observed that the fluid acquires a net vertical component of angular momentum opposite to the rotation of the heat source. We have repeated this experiment in a cylindrical annulus in order to restrict the radial motions and have found that the same phenomenon occurs. Using a simple model based on the latter experiment we investigate the mechanism by which a fluid can acquire and maintain this momentum, considering that friction is the only force which can exert a net torque about the vertical. The effects of the heat source are replaced by a forced temperature field which has sinusoidal variations in the circumferential direction and which rotates about the vertical axis at a constant rate. The correlation between vertical and horizontal velocity components in the equilibrium state has been computed from the linearized two-dimensional vorticity equation. It is shown that when the viscosity is small or when the speed of the heat source is large there is a convergence of horizontal momentum towards the center of the channel which is balanced by the viscous stress of the induced mean motion. The total momentum of the fluid is computed from the conservation principle and is found to vary inversely as the square root of the molecular viscosity and inversely as the 5/2 power of the speed of the heat source. *Subject Headings:* **1. Moving flame experiment 2. Circulation models.**—*Author's abstract.*

11.9–250 551.511.32:551.55

Fortak, Heinz (*Berlin-Mariendorf, Ankogelweg* 14), **Über verschiedene Darstellungen des isobaren Windvektors.** [Various representations of isobaric wind vectors.] *Zeitschrift für Meteorologie*, Berlin, 12(4/6):163–172, April/June **1958.** 17 refs., 53 eqs. **DWB, DLC**—A kinematic representation of the isobaric wind vector V, in which only the four scalar field functions K, α, D and ζ appear, is obtained from the two representatives of the convective terms of the Eulerian acceleration—once with the aid of kinetic energy K and vorticity ζ and then with the aid of divergence D, the kinetic energy and the isogonal direction α. The K, α, D and ζ necessary for scalar differential equations (energy, isogon, divergence and vorticity equations) are derived from the dynamic equations and consist of different forms. The energy and isogon equations provide a representation of the isobaric wind vector V, in which it appears as split into a geostrophic and ageostrophic component. The component in the geostrophic direction depends basically upon the individual temporal change of the isogonal direction while ageostrophic component perpendicular to it depends only upon the individual

temporal changes of the kinetic energy. The different forms of the dynamic equations yield further representations in which only partial derivations of vector V appear in addition to other field magnitudes. If the generalized vertical velocity ω is eliminated with the aid of the first law of thermodynamics there result representations which contain only the partial derivatives of the geopotential field in addition to the partial derivations of V. *Subject Headings:* **1. Isobaric analysis 2. Wind vector calculations 3. Kinematics of wind fields.**—*Transl. of author's abstract (I.L.D.).*

GENERAL CIRCULATION

See also: **Baroclinic atmos.** (Monin, Obukhov), 11.9–217.

11.9–251 551.513:532.5:608.5

Oi, M. (*Osaka Gakugei Univ.*), **Preliminary report of a rotating dishpan experiment with no temperature gradient.** *Meteorological Society of Japan, Tokyo, Journal, Ser. II*, 36(6):217–226, Dec. **1958.** 9 photos, 9 refs., 3 eqs. **DWB, DLC**—This is a preliminary report of an experiment in a rotating dishpan with topographical barrier and no temperature gradient, to study the effect of topographical barriers on zonal currents in the atmosphere or in the ocean, in the case of no latitudinal variation of rotating velocity to verify the author's previous theoretical results. *Subject Headings:* **1. Rotating dishpan experiments 2. Zonal currents 3. Topographic effects on zonal currents.**—*Author's abstract.*

11.9–252 551.513.2:551.557.5:551.465(263)

†Newton, Chester W., **Synoptic comparisons of jet stream and Gulf Stream systems.** (In: Bolin, Bert (*ed.*), **The atmosphere and the sea in motion.** N. Y., Rockefeller Institute Press, **1959.** p. 288–304. 18 figs., table, 47 refs., eq.) **DLC.** Also issued as: Chicago. Univ. Dept. of Meteorology, Contract Nonr 2121 (10) and Contract NR 082-161, Technical Report, No. I, Feb. **1959.** 34 p. 18 figs., table, 47 refs., eq. **DWB**—Comparisons are made between typical examples of oceanic and atmospheric current structures. These indicate that the lateral dimensions of the Gulf Stream are about 1/25 those of the jet stream; the shapes of the current profiles are almost identical, with equivalent lateral shears. In the vertical, the dimensions are nearly in the ratio 1:10, which also characterizes meander sizes. Striking similarities are found between thermal structures in the two systems. In both, variations from pronounced frontal concentrations to more gentle and broad barocline structures are observed over short distances or time intervals. Frontal slopes are equal, as are the vertical shears observed within frontal layers. Marked axial variations of speed, and of lateral and vertical gradients of current speed and temperature, are present in both systems. Ageostrophic motions are to transverse circulations and to inertia oscillations in the current systems. *Subject Headings:* **1. Jet stream-Gulf Stream comparisons 2. Inertia oscillations 3. Jet stream dynamics 4. Gulf Stream dynamics.**—*Author's abstract.*

ATMOSPHERIC DISTURBANCES

See also: **Weather effects on sawflies** (Graham, Satterlund), 11.9–50; **Cyclone movement-flood relationships** (Freĭdzon), 11.9–184; **Frontal analysis** (Ball), 11.9–215; **Cyclone deepening forecasting** (Snopkowski, Welch), 11.9–216; **Thunderstorm forecasting** (Tkachenko), 11.9–222; **Formation of Taimyr high** (Rafailova), 11.9–225; **Large scale weather processes** (Khrabrov), 11.9–228, 11.9–229; **Intertropical front-jet stream relationships** (Genève, Jacquemard), 11.9–302.

11.9–253 551.515.1:551.557.5

Newton, Chester W., **Axial velocity streaks in the jet stream: ageostrophic "inertial" oscillations.** *Journal of Meteorology*, Boston, 16(6):638–645, Dec. **1959.** 8 figs., 13 refs., 20 eqs. **DWB, DLC.** Also issued as: Chicago. Univ. Dept. of Meteorology, Contract Nonr 2121 (10), Contract NR 082-161, Grant NSF-G6353, Technical Report, No. 2, April **1959.** 26 p. 8 figs., 12 refs., 20 eqs. **DWB**—An air particle alternately speeds up and slows down, as it passes through local isotach maxima. It is shown that on the average, the observed period

of such speed variations in the core of the jet stream is about twice the period of an inertial oscillation. Periods are somewhat longer for mean anticyclonically-curved, and shorter for cyclonically-curved flow. The length of a maximum velocity streak, measured between successive points of minimum speed, is greatest when the average wind speed in the jet axis is large, and is greater at low than at high latitudes, other things being equal. This behaviour is consistent with the hypothesis that, for an air particle in the jet core, the geostrophic (or gradient) wind velocity varies at one-half the vector change in the actual wind velocity. Outside the jet core, where periods are longer due to smaller wind speeds, the geostrophic (or gradient) wind more nearly accomodates to changes in the actual wind velocity. *Subject Headings:* **1. Inertia oscillations 2. Jet stream structure.**—*Author's abstract.*

11.9–254 551.515.2:061.3

American Meteorological Society, **Proceedings of the Board of Review and Conference on Research Progress: final session of Technical Conference on Hurricanes sponsored by American Meteorological Society, Miami Beach, Fla., Nov. 22, 1958.** *U. S. Weather Bureau, National Hurricane Research Project Report,* No. 27, March 1959. 25 p. "Program and abstracts of papers presented listed in *Amer. Met. Soc., Bulletin,* 39(9):496–501, Sept. **1958.**" **DWB** (M15.2 U5845r)—The minutes of the meeting of the Board of Review and Conference on Research Progress held at Miami Beach, Nov. 22, 1958 under the chairmanship of ERIK PALMÉN, Institute of Meteorology, University of Helsinki, Finland are given. Papers discussed at this technical conference were on all the aspects of hurricanes as originally presented at other meetings. *Subject Heading:* **1. Hurricane conferences. I. Technical Conference on Hurricanes, 1958.**—*N.N.*

11.9–255 550.342:551.515.2(52)

Kishinouye, Fuyuhiko and Kotaka, Mieko (*both, Earthquake Research Inst.*), **Microseisms and typhoons.** *Tokyo. Univ. Earthquake Research Institute, Bulletin,* 37(1):171–176, **1959.** 5 figs., 2 refs. Japanese summary p. 176. **DWB** (P)—Brief discussion on relationships between microseism and the central pressure, the travelling velocity of the typhoons "Jane," "Kezia," "Patricia" and "Ruth," and the wind velocity at Osaka station. From the plottings presented, the amplitude at Osaka was deduced to be inversely proportional to distance, but this hypothesis does not square with the observations at Tokyo and Akita. *Subject Headings:* **1. Microseism-typhoon relationships 2. Japan.**—*W.N.*

11.9–256 551.515.2:551.542.1

Malkin, William (*Hydromet. Sec., U. S. Weather Bureau*), **Filling and intensity changes in hurricanes over land.** *U. S. Weather Bureau, National Hurricane Research Project Report,* No. 34, Nov. **1959.** 18 p. 5 figs., 4 tables, 17 refs., 2 eqs. **DWB** (M15.2 U5845r)—The change in central pressure after landfall of 13 selected hurricanes is analyzed. A formula that fits the average filling curve is given. The average change in pressure gradient after landfall is also evaluated. One of several incidental findings pertains to the consistent values obtained when applying an objective definition for the pressure at the periphery of a hurricane. *Subject Headings:* **1. Hurricane pressure data 2. Pressure change analysis.**—*Author's abstract.*

11.9–257 551.515.2

Rodewald, M., **Hurrikan CARRIE, Sept. 1957 und die deutsche Schiffahrt.** [Hurricane Carrie, Sept. 1957, and German shipping.] *Der Wetterlotse,* Hamburg, No. 125:249–262, Dec. **1957.** 4 figs. Also: **Die Bedeutung einer "Kleinigkeit" bei der Wetterfunkaufnahme.** [Importance of a "trifle" in a radio weather message.] *Ibid.,* p. 266–269. fig. Also: **Die Luftströmung in einem Wirbelsturm.** [Air currents in a cyclone.] *Ibid.,* p. 270–271. fig. **DWB**—The first paper contains a number of authentic reports from ships within the risk-zone of the severe hurricane "Carrie" (Sept. 5–23, 1957) and is a tribute to the weatherman and his forecasts and reports. The next paper deals with transmission of radio weather messages. Radio transmission of the expression "North of East" can be inadvertently sent or received as "North or East" since the difference is only one dot (f = . . — . r = . — .). Likewise, incorrect interpretation of the English expression "moving slightly" to read "slowly moving" as the too carefree professional efficiency of a German radio operator caused. The last paper

presents sketches of the vorticity movement of "Carrier" as made by a ship's officer: eccentric and clockwise rather than concentric and anti-clockwise. *Subject Headings:* **1. Hurricane "Carrie," 1957 2. Hurricane movement 3. Radio weather transmissions.**—*W.N.*

11.9–258 551.515.2:061.1(73)

Sik, A. E. and Sadowski, Alexander (*both, Forecasts and Synoptic Reports Div. U. S. W. B.*), **The hurricane warning service of the U. S. Weather Bureau.** *Mariners Weather Log*, Wash., D. C., 3(4):125–127, July **1959.** 2 figs. **DWB**—The importance of immediate ship reports is shown in this outline of operational methods and means to render early storm warnings. Hurricane "Daisy" was first reported by S/S "Almar," Aug. 24, 1958 when encountering low pressure and strong winds near 26.9°N lat., 75.7°W long. ENE of Miami, Fla, enabling closer reconnaissance and subsequent forecastings by hurricane forecast centers. Locations of these centers are plotted on two maps. *Subject Headings:* **1. Hurricane warning services 2. U. S. Weather Bureau hurricane warning service.**—*W.N.*

11.9–259 551.515.2:551.553.8(52)

*Wakida, T., **Some statistical results of typhoons approaching southern Kyushu.** *Journal of Meteorological Research*, Tokyo, 10(7):615–617, July **1958.** 4 figs., 7 tables, eq. In Japanese. **DLC**—Statistical analysis is made for forecasting using the data from 1940–1955 of the north-bound velocity, direction of typhoon center in different latitudes, maximum wind velocity, and instantaneous maximum wind velocity of typhoons approaching southern Kyushu. The graphed and tabulated data are given. *Subject Headings:* **1. Typhoon statistics 2. Kyushu, Japan.**—*J. H. Woo.*

11.9–260 551.515.31(47)

Dva smercha. [Two tornadoes.] *Priroda*, Moscow, No. 6:112–113, June **1959.** 2 figs. (photos). **DWB, DLC**—The passage of two tornadoes—one on June 24, 1958 in Pskov Region, the other on Aug. 24, 1958 in Gorki Region—are briefly described in letters to the editor. The first, partially passing over Usviatskoe Lake, lifted boats lying on the shore and threw the broken parts a distance of several hundreds of meters; further inland it damaged houses and woodlands and toppled telegraph poles. The second appeared in the form of a white column of irregular outline with funnel shaped expansions at the top and bottom against a background of thunderstorm clouds. The column moved quicker than the approaching clouds. A whirlpool lifting rubbish, sand, grass and hay occurred under the column. There were no important constructions in its path. Two photos of the second tornado are included. *Subject Headings:* **1. Tornadoes 2. European U.S.S.R.**—*A.M.P.*

11.9–261 551.515.4(237.1)

Colson, DeVer, **Thunderstorm analysis in the northern Rocky Mountains.** *U. S. Forest Service. Intermountain Forest and Range Experiment Station (Ogden, Utah), Research Paper*, No. 49, **1957.** 10 p. 21 figs., 2 tables. **DWB** (M15.4 U583th)—This paper reports and discusses in detail the occurrence and movement of thunderstorms during the 1955 fire season in the northern Rocky Mountain area and the meteorological conditions associated with these storms. The important meteorological factors are the moisture patterns in both the lower and upper levels, the temperature and wind profiles, the instability of the airmass, and the lifting mechanisms. *Subject Headings:* **1. Thunderstorms 2. Rocky Mts.**—*Author's abstract.*

11.9–262 551.515.81

Longley, Richmond W., **The three-front model—a critical analysis.** *Canada. Meteorological Div., CIR-3245*, TEC-309, Sept. 8, **1959.** 14 p. 4 figs., table, 16 refs. **DWB, DLC**—An analysis is made of the literature dealing with the Canadian Three-Front Model and with the postulates arising from an acceptance of this model. It is concluded that the model as presently defined fails to be verified in many circumstances by the observational data. Before universal acceptance of the model can be expected, further study is necessary to make it more in line with weather data. *Subject Headings:* **1. Frontal analysis 2. Three front circulation model.**—*Author's abstract.*

11.9–263 551.515.8:551.577.2(497.2)

Martinov, M., **Niakoi osobenosti pri valezhite po studenite frontove ot severozapad nad severozapadnata i tsentralnata chast ot Severna Bŭlgariia.** [Some peculiarities of precipitation at northwesterly cold fronts over the northwestern and central parts of north Bulgaria.] *Khidrologiia i Meteorologiia*, Sofia, No. 5:45–61, **1958.** 2 figs., 6 refs. Russian and English summaries p. 60–61. **DLC** —The author discusses the effects of northwesterly cold fronts upon precipitation in northern Bulgaria. The study is based on the analysis of 63 cases of cold fronts which have passed over the country from 1951 to 1955, inclusive. Two types of cold fronts are established: 1) those situated in large pressure troughs whose peripheral parts pass over Bulgaria, moving rapidly and producing only insignificant precipitation, and 2) those in which the center of the cyclone is located over the Balkan peninsula, moving slowly, and producing more persistent disturbances and more significant precipitation. About three-fifths of the cold fronts passing over the country from the NW are of Type 1, and most of them occur during the cold part of the year, while most of the fronts of Type 2 occur during the warm season. *Subject Headings:* **1. Cold front effects on precipitation 2. Frontal type precipitation 3. Bulgaria.**—*From author's abstract.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Sec. D1**, p. 1412; **High altitude radiation**, 11.9–4; **Infrared spectroscopy** (Lecomte), 11.9–14; **Night airglow res.** (Krasovskiĭ), 11.9–20; **Balloon study of upper atmos. radiation** (Winckler), 11.9–23; **Radiation res.**, 11.9–28; **Sunshine effects** (Sternes), 11.9–46; **Electro-hydromagnetic waves** (Cole), 11.9–68; **Solar radio bursts** (Peterson, Winckler), 11.9–72; **Sun's atmos.** (Chapman), 11.9–73; **Solar radiation** (Kozyrev), 11.9–91; **Night airglow** (Krasovskiĭ et al.), 11.9–127; **Auroral effects on corpuscular radiation** (Osterbrock), 11.9–128; **Solar radiation pressure effects** (Musen), 11.9–150; **Solar effects** (Wyatt), 11.9–151; **Solar propulsion of space vehicles** (Hock et al.), 11.9–153; **Infrared radiation measurement** (Murcray et al.), 11.9–198; **Atmos. counterradiation** (Sauberer), 11.9–204; **Solar-weather relationships** (Baur), 11.9–227; **Radiation flux** (Ozawa), 11.9–277; **Radiation fog** (Regula), 11.9–304; **Cloud effects on radiation** (Feĭgel'son), 11.9–307.

11.9–264 551.521:551.524:551.525(766)

*Hembree, G. Daniel, **Effect of the state of the ground on the local heat balance.** *Monthly Weather Review*, Wash., D. C., 86(5):171–176, May **1958.** fig., 6 tables, 9 refs. **DWB, DLC**—The heat absorbed by the air during the diurnal temperature rise is computed for Oklahoma City. Insolation measurements are recorded for each day, and the energy that is not used in raising the temperature is assumed to represent an empirical integration of the other terms of the local energy balance. With this empirical value taken to the sum of energy losses, computations are made to show the ratio of the energy loss to the total insolation. These ratios of energy loss are correlated to the observed states of the ground. The computations are made for 141 days taken at random during one year. Eight ground states are used in the analysis and significance tests. The results show that the state of the ground affects the energy balance to such an extent that errors of 4°F or more in maximum temperature forecasts may be due entirely to the effect of the state of the ground. *Subject Headings:* **1. Earth temperature effects on heat balance 2. Heat balance 3. Diurnal temperature rise 4. Oklahoma City, Okla.**—*Author's abstract.*

11.9–265 551.521:551.326.7(268)

Iakovlev, G. N. (*Academy of Sci., U.S.S.R.*), **Solar radiation as the chief component of the heat balance of the Arctic ice.** *National Research Council, Wash., D. C., Publication*, No. 698:181–189, Dec. **1958.** 4 figs., 3 tables, 4 refs. **DLC, DWB** (551.311 A675pr). Transl. from the Russian by D. Skvirsky, Moscow, **1958.**—Extensive data collected by the North Pole II drifting station made it possible to study the radiation regime, to calculate the radiation balance in the central Arctic, and to calculate the approximate heat balance of the ice sheet.

An analysis of the actinometric data yielded a series of new and valuable facts about direct, diffuse, total and reflected radiation, as well as about the radiation balance in the Arctic Basin. Based on these investigations, the present paper reviews the features of the heat balance of the Central Arctic and describes the role it plays in the destruction of sea ice. *Subject Headings:* **1. Radiation balance 2. Heat balance of ice 3. Arctic. I. Skvirsky, D.** *(transl.) —I.S.*

11.9–266 551.521:620.91(584.4)

*Iaroslavtsev, I. N., **O kolebaniiakh summ teploty ot radiatsii solntsa i neba i raspredelenii energii etikh radiatsiĭ vo vremeni dlia Tashkenta.** [Variations in heat sums from solar and sky radiation and temporal energy distribution of these radiations at Tashkent.] *Akademiia Nauk SSSR. Energeticheskiĭ Institut, Ispol'zovanie solnechnoĭ energii, Sbornik 1.* Moscow, **1957.** p. 24–31. fig., 10 tables, 5 refs. **DWB** (621.47 B347is)—Data are presented on the deviation of annual radiation totals of direct, total, diffuse and reflected radiation from mean annual values in percent for Tashkent; variation of monthly totals of heat from direct solar radiation for a horizontal surface at Tashkent, Odessa, and Pavlovsk; deviations in percent of mean monthly sums of heat from the various radiation types from the totals possible for Tashkent; the number of days of direct solar radiation per month for 25 yrs of observation; number of days with total radiation (sun+sky); number of days with sky radiation only for 15 yrs of observations; probable monthly incidence of favorable days for utilizing solar energy; mean monthly hourly distribution of the total radiation incident upon a perpendicular surface (average of 25 yrs); total mean of direct and diffuse radiation of 15 yrs of observations; and number of hours of solar energy that can be utilized at different times of the day and during different months. It is concluded that even in such an insolated region as Tashkent there are no periods absolutely constant for the technical utilization of solar energy. *Subject Headings:* **1. Annual radiation variations 2. Solar energy 3. Tashkent, Uzbek S.S.R.**—*I.L.D.*

11.9–267 551.521:551.510.53:551.511.33

†Ohring, George (*GRD, AF Camb. Res. Center*), **The radiation budget of the stratosphere.** *Journal of Meteorology*, Boston, 15(5):440–451, Oct. **1958.** 16 figs., 2 tables, 32 refs., 12 eqs. **DWB, DLC**—The radiation budget of the Northern Hemisphere stratosphere, as a function of the mean thermal structure and composition of the stratosphere, is determined for the months of January, April, July, and October. Emission of infrared radiation by carbon dioxide, water vapor, and ozone is calculated by means of a simple numerical method derived from the differential equations of radiative transfer. Absorption of solar radiation by ozone is taken from published results; absorption of solar energy by water vapor is computed with the aid of an empirical formula. It is found that, in general, radiative equilibrium is not obtained at any latitude. Low latitudes constitute a heat source and high latitudes a heat sink in the stratospheric energy budget. It is shown that carbon dioxide is more important than water vapor in cooling the stratosphere and that infrared transfer in the 9.6μ ozone band normally results in a convergence of energy in the stratosphere. Some features of the stratospheric temperature distribution and circulation pattern are inferred from the computed radiation budget and its seasonal variations. (For abstract on this from another source, *see* 9.9–170, Sept. 1958, *Met. Abs.*) *Subject Headings:* **1. Radiation budget 2. Stratospheric radiation 3. Energy budget.**—*Author's abstract.*

11.9–268 551.521:551.511:551.524.36(439.1)

Rákóczi, Ferenc, **A hőmérsékleti maximumot kialakító két fontos tényező vizsgálatáról.** [Investigation of two factors of importance in the development of maximum temperature.] *Időjárás*, Budapest, 63(1):1–6, Jan./Feb. **1959.** 3 tables, 8 refs., 9 eqs. German summary p. 1. **DLC**—Relations between maximum temperatures, relative geopotential and global radiation at the time of occurrence of maximum temperature on clear, overcast and cloudy days are investigated (Budapest, 1954–1956). It is found that relative geopotential has more influence than global radiation on maximum temperature. The relationship obtained provides a limited means of forecasting maximum temperature. *Subject Headings:* **1. Maximum temperature forecasting 2. Relative geopotential-temperature relationships 3. Budapest, Hungary.**—*Transl. of author's abstract.*

11.9–269 551.521.1:633.14

Ross, Iu. K., **O korotkovolnovom radiatsionnom rezhime poverkhnosti, pokrytoi rastitel'nost'iu.** [Short wave radiation balance of earth's surface covered with vegetation.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Institutas, Moksliniai Pranešimai*, 5:41–60, **1957.** 4 refs., 4 tables, 12 figs., 8 eqs. **DWB**—As a result of a series of actinometric measurements a scheme showing the shortwave balance according to distinct components is given for the soil-vegetation system. The formulas for calculating the flow of radiation is derived. The scheme is applied in studying short wave radiation balance of a rye field. *Subject Headings:* **1. Short wave radiation balance 2. Rye fields.**—*Author's abstract.*

11.9–270 551.521.11:551,576.1(468.2)

Hurst, G. W., **Variation in sunshine at Gibraltar.** *Meteorological Magazine*, London, 87(1033):193–197, July **1958.** 2 figs., 2 tables, ref. **DWB, DLC**—Influence of clouds, particularly the levanter cloud, on sunshine is discussed. Tabulated monthly and annual average and extremes as recorded at Windmill Hill, 1938–1947, and at North Front (near Spanish border), 1948–1956, are compared. The average figures for sunshine for the same sites include mean monthly total percentage. The average, monthly, and annual cloud amount for 8 surrounding stations are given for comparison. It is shown that Gibraltar is the cloudiest station of the area, its southern tip sunnier though, since less affected by cumulus and levanter stratus clouds. *Subject Headings:* **1. Sunshine variations 2. Cloud effects on insolation 3. Gibraltar.**—*W.N.*

11.9–271 551.521.12:551.511:061.3

Portnov, G. L., **Soveshchanie po aktinometrii i teplovomu balansu.** [Conference on actinometry and thermal balance.] *Meteorologiia i Gidrologiia*, Leningrad, No. 10:57–58, Oct. **1957. DWB, DLC**—On June 13, 1957, the Institute of Physics and Astronomy of the Academy of Sciences of the Estonian S.S.R. held a conference on actinometry and heat balance. Among the papers delivered the following are mentioned: **Transport of heat radiation in the atmosphere and associated problems** by K. Ia. Kondrat'ev; **Radiation field in the free atmosphere and variations of albedo with height** by N. P. Piatovskoĭ; **Relative spectral brightness of the elements of an aerial landscape** by Iu. I. Rabinovich, etc. *Subject Headings:* **1. Actinometric and heat balance conferences 2. Heat balance.**—*I.L.D.*

11.9–272 551.521.13

Sterne, Theodore E. (*Smithsonian Astrophysical Observ. and Harvard College Observ.*) and Dieter, Nannielou (*Harvard College Observatory*), **The constancy of the solar constant.** *Smithsonian Contributions to Astrophysics*, Wash., D. C., 3(3):9–12, **1958.** fig., 3 refs. Also: Abbot, C. G. (*Research Associate, Smithsonian Inst.*), (**Comment**) *Ibid.*, 3(3):13–21, **1958.** 9 figs., 9 refs. **DWB**—To evaluate possible real changes in the solar constant, the covariance was calculated of 10-day mean values of determinations of the solar constant made simultaneously at two stations, in Chile and California, over a period of nearly 30 yrs. Serial correlation coefficients were also calculated separately for the two stations. The covariance indicated that if real changes occurred their standard deviation over this period was smaller than 0.17% of the solar constant. The serial correlation coefficients indicated no periodicities common to both stations in the solar constant. *Subject Heading:* **1. Solar constant.**—*Author's abstract.*

11.9–273 551.521.14:551.579.5:633.18

Maruyama, E. and Koshimura, O., **Observation of the visible and ultra-violet rays of solar radiation at an upland-rice field.** *Japan. Meteorological Agency, Tokyo, Memoirs of Industrial Meteorology*, 21(1):17–22, **1957.** 7 figs., 5 tables. In Japanese; English summary p. 22. **DLC**—The authors have observed the visible portion and ultraviolet rays of solar radiation at an upland-rice field. The results are shown in figs. and a table. Fig. 2 gives the daily course of solar radiation in various portions of the field. If I represents the radiation at the surface of leaves, x the thickness of the leaf in mm, and Ix the radiation which penetrates the leaf and reaches the under surface of the leaf, the following relation exists: $Ix/I = 0.43e^{-10.7x}$. The table shows the albedo of various surfaces, and the authors have obtained the following

relations between the soil moisture of clay or loam and the albedo: $Y=67.1e^{-0.01x}$ . . . for clay; $Y=63.7e^{-0.03x}$ . . . for loam, where y and x respectively indicate the albedo and the moisture content in wet soil. *Subject Headings:* **1. Albedo of leaf surfaces 2. Albedo of soil 3. Soil moisture content 4. Rice fields.**—*Authors' abstract.*

TEMPERATURE

See also: **Thermal balance of earth's surface** (Muminov), 11.9–43; **Temp. effects** (Sternes), 11.9–46; **Forest temps.** (Rasche), 11.9–48; **Unit of wintriness** (Kyriazopoulos), 11.9–191; **Isothermal charts** (Teweles, Finger), 11.9–214; **Forecasting air temp.** (Stevens), 11.9–221; **Minimum temp. forecasting** (Rákóczi), 11.9–226; **Temp. anomalies, W. Siberia** (Sergeev), 11.9–230; **Earth temp. effects on heat balance** (Hembree), 11.9–264; **Maximum temp. forecasting** (Rákóczi), 11.9–268; **Temp. gradient-viscosity relationships** (Froment), 11.9–284.

11.9–274 551.501.42:551.506.3:551.524(494)

*†Bider, M.; Schüepp, M. and von Rudloff, H., **Die Reduktion der 200 jährigen Basler Temperaturreihe.** [Reduction of the 200- year temperature record of Basel.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 9(3/4):360–412, **1959.** 8 figs. (incl. photos), 15 tables, 57 refs. German, English and French summaries p. 360. **DWB, DLC**—The temperature series of Basel hitherto studied back to 1826 has been extended to 1755 by means of the observations of J. J. D'Annone. The whole series is now reduced to the present position of the meteorological station at St. Margarethen near Basel, whereby also the increasing town effects have been taken into account. Methods for the reductions have been developed which enable a numerical analysis of the different sources of error. A comparison with other secular series leads to the conclusion that this Basel series of 1755–1957 represents a valuable completion of the hitherto existing Central European material, since it completes e.g. the triangle De Bilt-Berlin-Bienna used by F. Baur, to a quadrangle. *Subject Headings:* **1. Temperature reduction 2. Long period temperature records 3. Basel, Switzerland.**—*Authors' abstract.*

11.9–275 551.524.32:519.241.6(497.1)

Manohin, V., **Eine Wiederholung der Durchschnittswintertemperaturen in Ljubljana nach 83 Jahren.** [Recurrence of average winter temperatures in Ljubljana after 83 years.] *Meteorologische Rundschau*, Berlin, 11(6):188, Nov./Dec. **1958.** fig. **DWB, DLC**—The recurrence of mean winter temperatures in Ljubljana after 83 years is demonstrated in the following manner. The temperature deviations of the winter months of December–January–February from the 100 yr mean are added and from two successive winters a new mean, representing the average three-month total of temperature deviation of two adjacent winters, is formed. Two columns of data giving the mean values of three-month totals of deviation from the 100 year means for two successive years are presented; these are 1851–1852 and 1852–1853, etc. and 1934–1935 and 1935–1936, etc. The numbers in the columns can be expressed as deviations from the column means. The correlation of the deviations is $r=0.71\pm0.069$. *Subject Headings:* **1. Winter temperatures 2. Temperature periodicities 3. Ljubljana, Yugoslavia.**—*I.L.D.*

11.9–276 551.524.36:551.588.1(985)

Parmuzin, Iu. P., **O zonal'noĭ prirode poliusa kholoda.** [The zonal character of the cold pole.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 90(5):472–474, Sept./Oct. **1958.** fig. **DLC**—The expansion of weather stations in Siberia has indicated that the zone of cold poles, i.e., an absolute minimum temperature below −67°C extends east of the Yenisei between 93°30′ and 160°30′E long. and between 53°30′ and 68°30′N lat. The zone of absolute temperature minima is determined primarily by its continental location where stable anticyclonic weather prevails during the cold part of the year. The cooling of the air near the ground, together with the stillness and low cloud cover amount favor very low absolute minima. Surface relief plays a role, since in depressions between mountains conditions are more favorable for frequent and intense cooling than in open localities. Also in the lowlands of eastern

Siberia, in the central Yakutsk lowland, and behind the Verkhoyansk ridge, the continentality of the climate is most marked. A map showing the cold zone of eastern Siberia is presented and data on the absolute minima for various points are given in the text. *Subject Headings:* **1. Cold poles 2. Minimum temperatures 3. Continentality 4. Soviet Arctic 5. Siberia.** —*I.L.D.*

11.9–277 551.511.33:551.521.33:551.524.4:551.525

Ozawa, Y. (*Div. of Met., National Inst. of Agric. Sci.*), **Some observations of the heat balance on the ground surface.** *Journal of Agricultural Meteorology*, Tokyo, 13(4):135–139, May **1958.** fig., 2 tables, 3 refs., 12 eqs. In Japanese; English summary p. 139. **DWB** — The profiles of temperature, humidity and wind velocity have been determined by conventional methods in the lowest 6 m of the atmosphere above a bare surface, with simultaneous observations of heat absorbed in the soil and of the short wave and long wave radiative flux of heat. Thirty-six sets of observations were made. The turbulent fluxes of heat and water vapor are also determined by an aerodynamic method which assumes equality of the eddy viscosity and the appropriate diffusion coefficient. Then the following equation of the heat balance on the ground surface is examined: $R-F-LE=G$, where R is the net radiation, F is the turbulent heat flux on the ground surface, LE is the latent heat of evaporation, and G is the heat absorbed in the soil. *Subject Headings:* **1. Heat balance of earth's surface 2. Radiation flux 3. Latent evaporation 4. Heat absorption by soil.**—*Author's abstract.*

11.9–278 551.501.724:551.524.7:535.34

Prokudina, V. S., **Opredelenie vrashchatel'noĭ temperatury gidroksila v verkhneĭ atmosfere.** [Determination of the "rotational" temperature of hydroxyl in the upper atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 4:629–631, April **1959.** 3 figs., 3 tables, 4 refs. **DLC**—The method of determining the temperature from the spectrum of OH is based on the assumption that the distribution of intensities in the branches of the rotating field is associated with the temperature of disturbance by the relationship $I_{em}=\text{const}\, i(J')e^{-\frac{W}{kT}}$ where I_{em} = intensity of rotating lines in relative units; W = energy of disturbance (in the given case the rotating energy of the initial level); $W=B_u'J'(J'+1)$; J' = rotating quantum number of the upper initial state; T = temperature of disturbance; $i(J')$ = intensity factor; k = Boltzmann constant. The temperature of disturbance was determined by $T=\frac{Bv'}{k}\frac{1}{\text{tg}\varphi}$ °K, where φ = angle between $\ln\frac{I_{em}}{i(J')}=\frac{Bv'}{kT}\times J'(J'+1)$ and the axis of the abscissa. The intensity fields are determined by $i(J')=\frac{(J'+1+\Omega)(J'+1-\Omega)}{(J'+1)}$ where J' = rotating quantum of the upper state and Ω = projection of the complete electronic moment upon the internuclear axis. The temperature determined for intense branches is presented in graphs, and temperatures for different days are presented in a table. The mean rotating temperature for the zone (9.3) is $T=240\pm20$ K°. *Subject Headings:* **1. Upper air temperature measurement techniques 2. Hydroxyl (OH) spectra 3. Rotational temperatures.**—*I.L.D.*

SOIL TEMPERATURE

See also: **Forecasting soil temp.** (Stevens), 11.9–221; **Earth temp. effects on heat balance** (Hembree), **11.9–264**; **Heat balance of earth's surface** (Ozawa), **11.9–277.**

11.9–279 551.506.3:551.525.4

*Müller, W., **Grossräumige Änderungen der Temperatur des Erdbodens seit 1911.** [Large scale variations in ground temperatures since 1911.] *Meteorologische Rundschau*, Berlin, 11(5):145–150, Sept./Oct. **1958.** 5 figs., table, refs. **DWB, DLC**—Long period variations in ground temperatures for depth of 1–12 m for the period 1911–1957 were investigated for the following localities in Europe, viz: Vienna, Potsdam, Southport, Alnarp, Moscow and Kiruna; and also for the sea surface at Helgoland. Two years running, seasonal and annual means

were computed for each point for depths of 1, 2, 4, and 12 m below the ground and for 2 m above the ground. The seasonal means were so formed that regardless of the month, the three monthly minima at a corresponding depth were combined into the "coldest quarter." Since the interval between the most extreme monthly mean almost always amounted to six months, transition seasons of equal duration were easily computed. An analysis of the seasonal variations revealed that the temperature variations in the ground were almost parallel to the temperature variations in the atmosphere. Frost effect and soil moisture were of subordinate importance. The differences between the lowest and highest ten-year mean in the soil were approximately of the same order of magnitude as in the air (2 m); they thus manifested practically no damping effect. Although the seasonal temperature variations in the ground were damped, the annual temperature variations of 10 year sliding means had the same intensity at all depths. Every warm or cold maximum reached, practically without modification, every depth in the same quarter appropriate to the particular depth. The climatic temperature variations manifested themselves even at 12 m. The 10-year sliding means of the seasonal temperatures and the 10-year sliding annual mean temperatures for the various depths are presented on graphs. The temperature variations analyzed for one station only (Vienna), showing moderate changes, are proven to be statistically significant. Also differences in heat flow in the soil resulting from the temperature variations are analyzed. *Subject Headings:* **1. Ground temperature variations 2. Long period records 3. Europe.**—*I.L.D.*

WATER TEMPERATURE

See: **Ocean temp. soundings** (Schroeder et al.), 11.9–178.

PRESSURE AND WIND

PRESSURE

See also: **Baric topography** (Johnson), 11.9–193; **Upper air pressure charts** (Teweles, Finger), 11.9–214; **Absolute topography** (Sedláček), 11.9–218; **Absolute topography** (Skoda), 11.9–219; **Forecasting circulation conditions** (Khrabrov), 11.9–229; **Wind vector calculations** (Fortak), 11.9–250; **Wind field-pressure relationships** (Koshinskiĭ), 11.9–289.

11.9–280 551.543:551.326.7(268)

Rodewald, Martin (*Hamburg*), **Die "Eis-Schaukel" im Nördlichen Polarmeer im Jahre 1955.** [The "ice-swing" in the Arctic Ocean during 1955.] *Annalen der Meteorologie*, Hamburg, 8(5/6):187–189, **1958.** 4 figs., 4 refs. **DWB, DLC**—An attempt is made to explain the Arctic "ice swing" of 1955 with the aid of the atmospheric pressure anomalies over the Arctic basin. In July 1955 a strong positive pressure anomaly lying over the British Isles extended a wedge into northern Russia and a stronger negative pressure anomaly covered Greenland and extended into the Arctic. This favored a uniform supplementary flow southwest from the North Atlantic across the sea region between Greenland and northern Scandinavia into the Arctic Ocean. This explains in part the origin of the ice mass in the Franz Josef Land sector. Less apparent is an explanation of the origin of an ice mass along the northern coast of Alaska; for the "rear" of the negative anomaly lay across the eastern Canadian archipelago and landward anomaly winds extended only to Banks Island from northern Greenland. Up to the first August week the polar pack ice at Point Barrow showed signs of a normal recession. In August 1955, an unusually reverse and extended negative pressure anomaly became established over the Arctic Ocean and conditions similar to those prevailing in July continued, namely a strong additional southwest wind (additional to the normal flow.) The pressure was now relatively low over Alaska and the additional flow was directed to its coast. The "rear" of the polar anomaly lay between Wrangel Island and Banks Island whereby the blocking of the coast by pack ice could take place. In September 1955 the positive anomaly moved from northern Europe to Novaya Zemlya and the additional flow had turned farther southward. The tendency for ice formation continued. On the other hand, over

Alaska an offshore additional wind arose as a result of high pressure over Alaska and the western Canadian Archipelago and the rather lower pressure over Eastern Siberia and the adjoining Arctic Ocean. The ice swing can be deduced thus from the pressure anomalies. The relation between pressure anomalies and ice conditions in 1954 is discussed briefly. *Subject Headings:* **1. Pressure anomaly effects on Arctic ice 2. Arctic ice movement 3. Arctic Ocean.**—*I.I.D.*

11.9–281 551.586:551.543.5:541.1:576.8

Bortels, H. (*Bakteriologie Inst., Berlin-Dahlem*), **Synchronbeobachtungen über Beziehungen physikalisch-chemischer und mikrobiologischer Reaktionen zu Luftdruckänderungen in und bei Braunschweig.** [Simultaneous observations of the relation of physico-chemical and microbiological reactions to atmospheric pressure changes in and near Brunswick.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 9(3/4):464–486, 1959. 11 figs., 4 tables, 15 refs., eqs. German, English and French summaries p. 464–465. **DWB, DLC**—In 1953 and 1954, shortly before the sunspot minimum, experimental investigations were carried out synchronously at four places of only few km distance from one another and showed that the fundamental principle of meteorobiological correlations deduced from former experimental investigations was maintained throughout. Independent of the location of the experiments, streaked phosphate precipitation and aerobic processes with microorganisms, like the considerable growth of an aerobic bacteria and its intensive swarming, were connected with anticyclonic weather conditions. Flocculent precipitation as well as slight growth and immobility of the bacteria were, on the other hand, related to cyclonic developments. Local variations of this fundamental principle are very probably based on the difference of extant absorbers for the effective agent. *Subject Headings:* **1. Physico-chemical effects of weather 2. Microbiological reactions 3. Pressure change effects 4. Brunswick, Germany.**—*Author's abstract.*

11.9–282 551.547:551.577.37

Godev, N. G.: **Vliianie na krivinite na izobarite vŭrkhu intenziteta na valezhite.** [Influence of isobar curvature on precipitation intensity.] *Khidrologiai Meteorologiia*, Sofia, No. 6:33–43, **1958.** 5 refs., 13 eqs. Russian and English summaries p. 42–43. **DLC**—By using the equation

$$w = \frac{1}{\rho l^2} \int_0^z \left(\frac{\partial \Delta p}{dx} + v \frac{\partial \Delta p}{dy} \right) dz,$$

where w is vertical velocity, ρ atmospheric pressure and Δp the Coriolis parameter, it is shown that the vertical velocity at a given level depends both on pressure tendencies and on the advection of cyclonic or anticyclonic vorticity in the lower layers. On the basis of the above equation it is shown that ascending movements may occur in regions with falling as well as with rising pressure. Hence, on account of the existing connection between vertical velocity and precipitation it becomes evident that precipitation depends on the same factors as w. An analysis of actual cases is made in support of this theory. *Subject Headings:* **1. Pressure effects on precipitation intensity 2. Pressure-vertical velocity relationships 3. Vertical velocities.**—*Author's abstract.*

11.9–283 551.557.2:551.547(98)

Heastie, H., **Average height of the standard isobaric surfaces over the North Polar regions in April and October.** *Meteorological Magazine*, London, 87(1036):301–306, Oct. **1958.** 10 figs., 6 refs. **DWB**—Charts of the Northern Hemisphere north of 60°N are taken from those to be used in revision of **Upper winds over the world** and include average 700, 300, 100 and 200–100 mb thickness for April and for Oct. 1949–53, with brief comments on method of constructing the charts and on interpretation of significant features of the charts and the circulation in the polar regions represented by them. This paper is a condensed version of *MRP*, No. 1020 (*see* 8.8–256, Aug. 1957, *Met Abs.*). Similar articles giving charts of relative topography for Jan. and July were published in *MRP*, No. 918 (*see* 6.11–272), *MRP*, No. 981 (*see* 8.1–255) and in *Meteorological Magazine*, 85:368, **1956** and 86:198, **1957** (*see* 8.5–227 and 8.10–28). *Subject Headings:* **1. Upper air wind charts 2. Relative topography charts 3. North Polar Regions 4. Northern Hemisphere.**—*M.R.*

WIND

See: **Automatic wind stations** (Sanuki), 11.9–211; **Wind vector calculations** (Fortak), 11.9–250.

TURBULENCE

11.9–284 551.551:551.524.4

Froment, G. (*Etablissement d'Études et de Recherches Météorologiques*), **Variation du coefficient de viscosité turbulente avec le gradient thermique vertical.** [Variations of the coefficient of turbulent viscosity with the vertical temperature gradient.] *Journal Scientifique de la Météorologie*, Paris, 8(29):17–21, Jan./March **1956.** 4 figs., 3 eqs. French, English and Spanish summaries p. 17. **DWB**—Using experimental data of A. R. Weiller, the author applies the theoretical relationship for angle between wind and isobars in the lower regions of a turbulent layer, and the coefficient of turbulent viscosity, in order to obtain a relation between this coefficient and the vertical temperature gradient. *Subject Headings:* **1. Coefficient of turbulent viscosity 2. Temperature gradient-viscosity relationships 3. Wind direction-isobar angle.**—*From author's abstract.*

11.9–285 551.551:551.557:551.508.822(547)

Venkiteshwaran, S. P. and Huddar, B. B. (*both, Met. Office, Poona*), **Some observations of turbulence in the upper troposphere over Poona.** *Indian Journal of Meteorology and Geophysics*, Delhi, 9(4):400–401, Oct. **1958.** fig., 6 refs. **DWB, DLC**—Regions of turbulence in the upper air were studied in 1954 after Venkiteshwaran and Jayarajan. Records from the F-type radiosondes during 1954 are discussed here, indicating that regions of turbulence are generally below the level of lowest temperature in the tropopause. There is no appreciable turbulence at about 17 km over Poona. *Subject Headings:* **1. Upper air turbulence 2. F-type (Indian) radiosondes 3. Poona, India.**—*N.N.*

11.9–286 551.501.75:551.551.5:523.164.85

Greenhow, J. S. and Neufeld, E. L. (*both, Jodrell Bank Exper. Station, Manchester Univ., Eng.*), **Measurements of turbulence in the 80- to 100-km region from the radio echo observations of meteors.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2129–2133, Dec. **1959.** 5 figs., 8 refs., 5 eqs. **DLC**—Measurements of irregular winds at heights of 80 to 100 km, using radio echoes from meteor trails, are described. Large irregularities with a vertical scale of 6 km, a horizontal scale of the order of 150 km, and a time constant of 6×10^3 sec are observed. The rms wind velocity associated with these irregularities is 25 m sec^{-1}. Turbulent wind shears of the order of 10 m sec^{-1} km^{-1} are found, although occasionally shears as high as 100 m sec^{-1} km^{-1} are observed. Lower limits for the scale and time constant of the smallest eddies are determined. *Subject Headings:* **1. Turbulence measurement 2. Radio echoes from meteor trails 3. Meteor trail wind observation.**—*Author's abstract.*

11.9–287 551.551.5:551.557.5

Raethjen, P. (*Univ. Hamburg, Germany*), **Über die Entstehung des "Jet-stream" und seiner Turbulenz.** [The formation of the jet stream and its turbulence.] *Meteorological Society of Japan, Tokyo, 75th Anniversary Vol. of the Journal*, pub. Nov. **1957.** p. 160–164. 2 figs., 3 refs. **DWB, DLC**—The jet stream, a wind with speed ranging between 40 and 100 m/s, is observed at levels of the upper troposphere and lower stratosphere. A typical characteristic is the clear air turbulence particularly important in the left part of the jet stream (left being understood as when speaking of rivers) in the Northern Hemisphere, and associated with the cyclonic circulation of this side of the jet stream. Dynamic processes and a planetary model are employed to explain this typical phenomenon of the general circulation. Convection phenomena (and turbulence also has its origin here) force the air to ascend; thereafter reaching dynamic equilibrium. These air masses move in the pole direction; this movement (500–1000 km) is responsible for the speed (50–100 m/sec) of the resulting west-east movement. It is evident that the configuration of the earth's surface can modify considerably this model; it has been possible to get a confirmation in the synoptic observations. The model given

above supposes a constant jet stream around the earth but perturbations are observed, for example where the regenerating pulses fail. *Subject Headings:* **1. Upper air winds 2. Jet stream turbulence 3. Clear air turbulence.**—*A. V.*

HORIZONTAL WIND DISTRIBUTION

11.9–288 551.552:551.507.321.2(776)

Giles, Keith C. and Peterson, Roy E. (*both, General Mills, Inc., Minneapolis, Minn.*), **A study of wind velocities from constant pressure balloons.** *Journal of Meteorology*, Boston, 14(6):569–572, Dec. **1957.** 2 figs., table, 4 refs., eqs. **DWB**—In connection with trajectory data of 10 flights made by General Mills during 1951 the following elements are determined: 1) balloon velocity (V); 2) balloon geostrophic velocity (V_g') computed from observed balloon velocities and accelerations, and 3) geostrophic velocity (V_g), as derived from contour spacing of constant pressure maps. Correlations between these three parameters are analyzed, although theoretically V_g' and V_g should be identical they were found to have a low correlation which is attributed to "differences in the scale of determining V_g from constant pressure charts and of measuring V_g' from the balloon trajectories," the computations of V_g' being sensitive to small-scale acceleration not necessarily reflected in the contours of the constant pressure chart. It is therefore concluded that "both V and V_g' provide good estimates of V_g in regard to speed and direction for geostrophic flow. However, the calculation of V_g' does not improve the usability of the balloon velocity as auxiliary data for a constant pressure chart." *Subject Headings:* **1. Balloon trajectories 2. Wind velocities 3. Minneapolis, Minn.**—*G.T.*

11.9–289 551.552:551.542(262.8)

Koshinskiĭ, S. D., **O postroenii kart poleĭ vetra nad morem.** [Constructing charts of wind fields over the sea.] *Meteorologiia i Gidrologiia*, Leningrad, No. 9:27–31, Sept. **1958.** 3 figs., table, 3 refs., eqs. **DWB, DLC**—In the construction of wind fields over open seas two approaches are used: one involving the use of atmospheric pressure, since it can be averaged easily and it varies gradually from point to point so that it can be extrapolated over the open sea from shore and island data; the second method uses actual wind observations, primarily, and pressure secondarily. While the latter is subjective to a considerable extent; the former, though essentially based upon a theoretical presupposition, is also subjective to some extent. In addition, this method neglects the nonstationary nature of the pressure field, the character of the weather, and the orography of coasts. With the aid of specific examples, the author describes the effect of these elements upon the wind regime of the sea. In the majority of instances of Apsheron storms of northerly direction, the wind in the first half is weaker than in the second half of the storm even though the pressure field is the same but varying markedly in intensity. The factor of nonstationary pressure field must be taken into account in the construction of maps of synchronous distribution of winds over areas during intensive development of synoptic processes. Atmospheric precipitation, in particular the intensity, influences horizontal transport so that weather must be considered. The effect of coast orography is analyzed for the Caspian Sea; it is necessary to determine the most probable velocity of the geostrophic wind, Vr, and the mean velocity, $\bar{V}$, as given by data of the nearest coastal or island station. The construction of wind field maps for the Caspian Sea requires the determination of $\bar{V}/Vr$ for different regions of the sea. The need for several approaches in the construction of wind field maps is stressed. *Subject Headings:* **1. Wind field above the ocean 2. Wind mapping 3. Pressure fields 4. Caspian Sea.**—*I.L.D.*

11.9–290 551.552(480)

*Venho, S. N., **On the distribution of wind in Finland.** *Finland. Ilmatieteellinen Keskuslaitos, Toimituksia*, No. 45, **1958.** 18 p. 5 figs., 14 tables, 2 refs. **DWB, DLC**—This report is the first study of the wind distribution for the whole of Finland that gives both the wind direction and speed frequencies accurately enough to serve modern practical purposes. It gives the latitudes and longitudes of the 13 observation stations and their percentage wind distribution, their average wind speed in knots during the 4 seasons and the wind distribution maps. *Subject Headings:* **1. Wind distribution 2. Finland.**—*N.N.*

11.9–291 551.553(434.1) 551.557(434.1)

Wachter, Heinz, **Wind und Höhenwind des Frankfurter Gebietes.** [Wind and upper air winds of the Frankfurt area.] *Meteorologische Rundschau*, Berlin, 11(6):183–185, Nov./Dec. **1958.** 6 figs., 7 refs. **DWB, DLC**—The wind conditions at Frankfurt a.M. are analyzed on the basis of hourly wind recordings for a 6 yr period (1951–1957). Wind velocity reaches a maximum at midday, subsides rapidly in the afternoon, and is constant at night. In winter, wind velocities at night are quite strong (2 m/sec), and the daily maximum is slightly greater. In spring and summer, night velocities are lower but a high maximum is reached by day. At the surface prevailing southwest wind direction, as a consequence of the general circulation and weather processes, is equally frequent by night and day aside from a small rotation of the direction of maximum frequency; the north-northeast direction, which is a second maximum, is most frequent at night (in spring the NNE frequency exceeds the SW frequency). In the case of winds aloft the NNE maximum is very weak, while the principal maximum is rotated from SW to WSW. At an altitude of 1500 m the wind directions are oriented W–E whereby in fall and winter there is a pronounced east maximum. In the course of several decades there have occurred years with strong and with weak winds. The windiest year in Frankfurt a.M. in the interval 1922–1956 occurred in 1923 with a mean of 2.0 Beaufort; the year with least intense winds was 1944 with 1.3 Beaufort. Isopleths of wind velocity at the surface, graphs of daily variation of wind velocity and wind roses at the ground and at the 850 and 700 mb levels, etc., are presented. *Subject Headings:* **1. Wind velocity distribution 2. Upper air wind frequencies 3. Frankfurt a.M., Germany.**—*I.L.D.*

WIND VARIATIONS

11.9–292 551.553:551.553.21:632.94(678.2)

Coutts, H. H. (*Colonial Pesticides Res. Unit, Tanganyika*), **Variations in surface wind speed during the south-east and north-east monsoons.** *Weather*, London, 13(12):410–412, Dec. **1958.** fig., 3 refs. **DWB**—A complex diagram shows wind speeds (in categories of <10, 10–15, 15–20 and >20 f.p.s.) during different times of the day during the year (6 mi northwest of Arusha at 4500 ft) on the slopes of Mt. Meru, northern Tanganyika, during July 1957–June 1958. The strengthening of the southeast monsoon from July–mid Nov. and an increase in wind speed between 8 p.m. and 1 a.m. is clearly depicted. The effect is not katabatic or local, but may be due to funneling of the southeast monsoon by the mountain ranges and beneath an inversion which has a diurnal variation in height and intensity. This information is useful in East Africa in planning for insecticide spraying, which is at an optimum below an inversion and with low wind speeds. *Subject Headings:* **1. Wind speed variations 2. Insecticide spraying 3. Southwest monsoon 4. Mt. Meru, Tanganyika.**—*M.R.*

11.9–293 551.553(473

*Koloskov, P. I. and Nazarova, I. V., **Skorost' vetra v Moskovskoĭ oblasti.** [Wind speed in the Moscow Region.] *Leningrad. Nauchno-Issledovatel'skiĭ Institut Aeroklimatologiĭ, Trudy*, No. 4:46–143, **1958.** 19 figs., 11+13 tables, 6 refs. **DLC**—In this comprehensive study of wind speeds in the Moscow Region the four times daily wind observations (wind vane) at 31 meteorological stations in the Moscow Region and adjacent regions for the period 1946–1955 were used. The data were transferred to punch cards, sorted by month and tabulated. The contents of this study include the following: general description of the relief and forest vegetation of the Moscow Region; mean monthly and annual wind velocity; wind frequencies of different velocities; diurnal variation of wind velocity; and duration of different wind velocities. The wind velocity in the Moscow Region is basically a function of relief and shelter of a locality by trees and buildings. The greatest velocity is observed during the cold period (November–March), the least during the warm period (May–September). The diurnal wind velocity has a large amplitude during the warm period and a small one during the cold period. Only the nocturnal velocity varies much during the year. Graphs showing the annual probability of different wind velocities at particular stations, the probability of wind velocities for different relief, different seasons, hours of the day, etc. and tables giving data on total wind duration of operational wind velocities, etc., are presented. An appendix contains a list of

the stations, and tables giving data on mean monthly wind velocity, mean monthly wind velocity for individual hours, probabilities of different wind velocities for each month, probability of wind velocity at different hours, number of hours (in range) of continuous duration of operational wind velocity, and probability of operational wind velocity for small blade vanes and for multiple blade vanes. *Subject Headings:* **1. Wind speed data 2. Moscow Region, U.S.S.R.**—*I.L.D.*

11.9–294 551.553.11(62)

*†Pedgley, D. E., **The summer sea-breeze at Ismailia.** *Great Britain, Meteorological Office, Meteorological Reports*, 3(19), **1958.** 19 p. 7 figs., 7 tables, 21 refs. **DWB.** Review in *Weather*, London, 14(2):75, Feb. **1959.**—Surface and upper air wind observations made at Ismailia, Egypt, at 20 min. intervals on the afternoons of Aug. 31, Sept. 11, and Sept. 13, 1954, are analyzed and shown graphically and in tables to present a picture of the structure of the sea breeze, time of arrival, horizontal positions of sea breeze front at regular intervals, changes in vertical structure (turbulence, dew point, clouds, etc.) to 10,000 ft. Then there is a statistical analysis of data for 25 selected days in June–September, 1949–52, which shows relationships between speed, direction and time of arrival, and between gradient wind and speed of sea breeze and weather (fog, temperature, dew point and wind) and, finally, a summary of the main features of the structure of the sea breeze. Conclusion is that with on-shore gradient wind, the sea breeze develops frontal characteristics as it moves inland, and the rate of advance of the front differs from that of the sea breeze. *Subject Headings:* **1. Sea breeze structure 2. Sea breeze front 3. Ismailia, Egypt.**—*M.R.*

11.9–295 551.553.21:551.557.5(54)

Ramaswamy, C. (*Regional Met. Center, Madras*), **A preliminary study of the behaviour of the Indian southwest monsoon in relation to the westerly jet stream.** *Geophysica*, Helsinki, 6(3/4):455–477, **1958.** 9 figs., 19 refs. **DWB, DLC**—A preliminary study of the Indian southwest monsoon in relation to the westerly jet stream has been made, using charts for sea level, 1.5 km and 500 mb level for Asia and East Europe for July 1953, a typical month of active monsoon and for August 1954, a typical month of weak monsoon. The monthly mean 700 mb maps for the Northern Hemisphere for July 1953 and August 1954 have also been examined in relation to the behavior of the monsoon. It has been shown that the atmospheric processes at 500 mb level and perhaps even aloft are more important than the processes in the lower troposphere and at sea level in determining the activity of the monsoon. The striking differences between the middle latitude patterns during active and weak monsoon have been brought out and tentative conclusions have been arrived at regarding the possible associations between the 500 mb level patterns in middle and low latitudes during active and weak monsoon. *Subject Headings:* **1. Indian monsoon 2. Jet stream-monsoon relationships 3. India.**—*Author's abstract.*

WIND EFFECTS

See also: **Wind machines** (Saturn), 11.9–44; **Wind pressure on structures,** 11.9–59; **Wind pressure on structures** (Pagon), 11.9–60.

11.9–296 551.556.8:551.326.7(268)

Sverdrup, H. U., **Stress of the wind on the ice of the Polar Sea.** *Oslo. Norsk Polarinstitut, Skrifter*, No. 111, **1957.** 11 p. 3 figs., 2 tables, ref., 5 eqs. **DWB** (M56.8 S968st)—The pilot balloon ascents made when the "Maud" in 1922–24 drifted with the ice to the north of northeastern Siberia have been examined. In only 20 of 375 cases was the wind found to be practically constant through several hundred meters above the layer of frictional resistance. On the assumption that this wind represented the geostrophic wind, the surface stress was computed from the results of these 20 observations. It was found that on an average the stress $\tau = 6.9 \times 10^{-6}\ qw^2$ (dyn/sec^2) where q is the density of the air and w the surface wind. Under adiabatic conditions $\tau = 5.2 \times 10^{-3}\ qw^2$. The direction of the stress did not coincide with the wind direction, as should be expected, but the stress was on an average directed 10° to the left of the wind. No great weight can be given to this discrepancy because of the un-

certainty of the data. The results are not conclusive but it is hoped that they may stimulate further studies of the problems. *Subject Headings:* **1. Wind stress on ice 2. Arctic Ocean.**—*Author's abstract.*

11.9–297 551.556.4:551.311.3(470)

†Sidorenko, A. V., **Eolovaia differentsiatsiia veshchestva v pustyne.** [Eolian differentiation of material in the desert.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.*, No. 3:3–22, **1956.** 7 figs., 5 tables, 39 refs. **DWB**—The author summarizes the geologic and present history of eolian sand deposits in the Kara Kum Desert and the extent and distribution of (1) eolian sands which are classified into two types—namely eolian sands which pass below into the fixed sands of aqueous origin which do not lose contact with their source and (2) wind blown sands, which lose spatial connection with the original sand; these latter are transported for some distances from the initial sands and are deposited often on dense uniform surfaces, most frequently clayey surfaces. These transported sands form the moving dunes. The author presents a comprehensive survey of the changes the sands undergo when they are wind-blown. This includes changes in their mechanical composition such as size distribution; changes in the shape and surface of the "sand grains"; changes in the mineral constitution of the sands; color changes; changes in their chemical composition; and changes in the salt content of sand layers as a result of being wind-blown. Extensive data are presented in graphs and tables. *Subject Headings:* **1. Eolian dust 2. Sand transport 3. Kara Kum Desert.**—*I.L.D.*

11.9–298 551.556.6:69

Farquharson, F. B. (*Eng. Exp. Station, Univ. of Washington, Seattle*), **Wind forces on structures: structures subject to oscillation.** *American Society of Civil Engineers, Structural Div., Journal*, Vol. 84, Paper 1712, July **1958.** 13 p. figs., 20 refs. **DWB** (P) –This paper is devoted to the problem of determining the wind forces on a structure, and that portion of the problem involving the structures which respond dynamically to the imposed wind force. *Subject Headings:* **1. Wind effects on buildings 2. Building resistance.**—*N.N.*

UPPER AIR WINDS

See also: **Wind vector calculations** (Charles), 11.9–192; **Jet stream dynamics** (Newton), 11.9–252; **Jet stream structure** (Newton), 11.9–253; **Upper air wind charts** (Heastie), 11.9–283; **Upper air turbulence** (Venkiteshwaran, Huddar), 11.9–285; **Jet stream turbulence** (Raethjen), 11.9–287; **Upper air winds, Frankfurt** (Wachter), 11.9–291; **Jet stream-monsoon relationships** (Ramaswamy), 11.9–295.

11.9–299 551.557:551.510.53

Faust, Heinrich (*Zentralamt des Deutschen Wetterdienstes, Offenbach a.M.*), **Starkwindschichten in der Stratosphäre?** [Heavy winds in the stratosphere?] *Raketentechnik und Raumfahrtforschung*, 2(4):117–120, Oct./Dec. **1958.** 4 figs., table, 16 refs. English and German summaries p. 117. Abstracted from reprint. **DWB** (M57 F217st)—An extension of the existing model of the atmospheric structure from 20 to 40 km gives indication of a secondary level of maximum winds or "Nullschicht" at 35–40 km and a second divergence free level (maximum vertical motion) at 12 km and a level of minimum horizontal pressure gradient at 20 km. The secondary "Nullschicht" is connected with the ozone layer. Contrasting vertical motions between these critical levels in high and low pressure areas are shown diagramatically. *Subject Headings:* **1. Stratospheric maximum wind level 2. Stratospheric "Nullschicht" 3. Atmospheric structure.**—*M.R.*

11.9–300 551.557:551.510.52

Faust, Heinrich (*Frankfurt a.M.*), **Die Windverhältnisse in der oberen Troposphäre.** [Wind conditions in the upper troposphere.] *Naturwissenschaftliche Rundschau*, Stuttgart, 9(8):317–318, Aug. **1956.** fig. **DWB, DLC**—A brief discussion of G. HOLLMANN's theoretical work on the origin of the characteristic wind conditions in the null layer. The determination of the difference between the actual and the true wind is described and the significance of this difference $\delta u = (1-\sqrt{1-u^2})(U-\bar{U})$ is discussed (δu = a measure of the amplitude of the

associated sine field; U = actual fundamental flow; $\bar{U}$ = mean pressure coordinates above the vertical). *Subject Headings:* **1. Tropospheric winds 2. Zero layer.**—*I.L.D.*

11.9–301 551.557.2:551.511.32

†Keller, W., **Wetterdynamische Analyse zweischichtiger Stromfeldkarten.** [Dynamic meteorology analysis of 2 level flow charts.] *Zeitschrift für Meteorologie*, Berlin, 12(1/2):6–24, Jan./Feb. **1958.** 10 figs., 32 refs. **DWB, DLC**—The absolute topographies, although their isopotentials provide an approximate picture of stressing conditions, are not suitable for determining the important horizontal stream field divergence and convergence, which are the principal causes of vertical motions. For special stream field investigation, which requires more exact local wind velocities, it is most suitable to use stream field maps with isotachs of the actual wind. In this way it becomes possible to calculate from the synoptical aerological maps local accelerations, in particular in stream flow and perpendicular to it. In addition vorticity can be calculated. The construction of stream fields is described; the mechanism determining weather processes is discussed from the point of view of dynamic equilibrium; and the importance of three-dimensional field representation of the true wind in providing a more objective analysis and in reducing the various simplifications assumed in geostrophic analysis and in various formulas is stressed. The true stream flow in two-level stream fields is examined for a specific weather situation and the prognostic application of this analysis to short range forecasting is considered. *Subject Headings:* **1. Dynamic analysis 2. Stream flow charts 3. Short range forecasting.**—*Author's summary and I.L.D.*

11.9–302 551.557.5:551.515.8(64/6)

Genève, R. and Jacquemard, G., **Les variations du "jet stream" moyen au-dessus de l'Afrique du N.W.** [The variations of the mean "jet stream" above northwest Africa.] *Meteorological Society of Japan, Tokyo, 75th Anniversary Vol. of the Journal*, pub. Nov. **1957.** p. 176–179. 2 figs., 3 refs. **DWB, DLC**—From two series of meridional sections for 1955 and 1956 the corresponding months are compared. Latitudinal shifts in the location of maximum winds are determined and linked to displacements of the intertropical front. *Subject Headings:* **1. Jet stream variations 2. Intertropical front—jet stream relationships 3. Northwest Africa.** —*Transl. of authors' abstract.*

VERTICAL MOTION

See: **Vertical motion theories** (Kohlsche), **11.9–248.**

AQUEOUS VAPOR, HYDROMETEORS AND HYDROLOGY

HUMIDITY

See: **Humidity measurement** (Usol'tsev), **11.9 12**; **Water vapor spectroscopy** (Murcray et al.), **11.9–199.**

EVAPORATION AND EVAPOTRANSPIRATION

See: **Evap. from soil** (Muminov), **11.9–43.**

CONDENSATION

See also: **Plant temp. and dew deposits** (Steubing, Casperson), **11.9–326.**

11.9–303 551.574.1:551.578.41:546.46

Gol'tiakov, N. F. and Krasikov, P. N., **Issledovanie vliianiia antimonida magniia na obrazovanie ledianykh chastits v pereokhlazhdennom vodnom tumane.** [Research on the influence of magnesium antimonide on the formation of ice particles in supercooled water drop clouds.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 82:36–40, **1958.**

5 figs., table, 4 refs. **DLC**—After discussing the parameters of glacogenic substances and those of ice, the authors consider the ice forming properties of Mg_3Sb_2. The method of production of Mg_3Sb_2 and the experiments for investigating its properties in form of crystallization nuclei, carried out in a cold chamber, are described in detail including the cold chamber, the observation on the processes within the chamber, photographing of the cloud droplets, melting and vaporization of the Mg_3Sb_2 by an electric arc, etc. Laboratory experiments on Mg_3Sb_2 as a reagent of water crystallization showed that during the vaporization of this substance in a supercooled fog, the upper temperature of the limit of formation of the ice phase fluctuated at −10 to −11°C; during the spraying of a water suspension of Mg_3Sb_2 into a cloud the limit rose to −8° or −9°C. It follows that Mg_3Sb_2 is in principle an effective reagent of crystallization of supercooled clouds. But the practical use of this substance is subject to a number of difficulties such as the instability of the substance, the difficulty of dispersing it, etc. *Subject Headings:* **1. Ice crystal formation 2. Supercooled clouds 3. Magnesium antimonide nuclei.**—*I.L.D.*

FOG

See also: **Light transmission by haze and fog** (Arnulf et al.), 11.9–333.

11.9–304 551.575.1:551.524.4(43)

Regula, Herbert (*Cologne*), **Entstehen und Verhalten von Strahlungsnebeln im Rhein-Main-Gebiet.** [Formation and behavior of radiation fogs in the Rhine-Main region.] *Meteorologische Rundschau*, Berlin, 12(5):139–142, Sept./Oct. **1959.** 5 figs., ref. German and English summaries p. 139. **DWB, DLC**—Investigation of fog formation in the Rhine-Main Area shows that fog formation is preceded by a gradual drop in dew point of about 4°C from the afternoon value. Visibility decreases to 1000 m by this time and thereafter drops to 100–200 m. After this, visibility, temperature and dew point remain unchanged at the surface. If radiation still continues, the thickness of the fog layer grows steadily and the former inversion at the surface turns into a moist adiabatic lapse rate inside the fog layer, which is surmounted by a slowly rising and intensifying inversion. *Subject Headings:* **1. Fog formation 2. Radiation fog 3. Rhine-Main Region, Germany.**—*Author's abstract.*

11.9–305 551.509.55:551.575.1:551.510.42(443/444)

§Fontaine, P. and Coudret, G., **Les brouillards de février 1959, leurs effets dans la région parisienne.** [Fogs in February 1959: their effects in the Paris region.] *La Météorologie*, Paris, Ser. 4, No. 55:221–233, July/Sept. **1959.** 11 figs., 3 refs. French, English and Spanish summaries. **DWB**—February 1959 was characterized in France by a particularly large number of fog days. In the zones lower than 700 m in altitude and according to the region, there were 10 to 22 supplementary days with fog. This article is an attempt to explain according to the evolution of the weather conditions, the incidents noted on the grid. The study deals especially with the conditions of appearance and disappearance of the anticyclone of February 1959 and with the corresponding fog zone. Synoptic charts and meteorological diagrams show the evolution of the atmospheric situation during the periods Feb. 10–12 and 15–16. The evolution of lower air masses and of fogs on these dates gives evidence of the importance of the atmospheric pollution factor in the development and structure of fogs in the Paris region. *Subject Headings:* **1. Fog frequency studies 2. Fog formation 3. Anticyclogenesis-fog formation relationships 4. Paris, France.**—*A.V.*

CLOUDS

11.9–306 551.576.1:551.578.11

Matveev, L. T., **K teorii obrazovaniia oblakov i samoletnykh oblachnykh sledov pod vliianiem peremeshivaniia.** [A theory of the formation of clouds and of vapor trails due to mixing.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:3–9, March **1959.** 4 figs., 2 refs., 22 eqs. **DWB, DLC**—The author develops a method for computing the water content of clouds (including condensation trails) formed as result of displacement of air masses with differing temperatures and moistures and the conditions of their formation. Starting with the

equations $T=\frac{T_1+nT_2}{1+n}$ and $s=\frac{s_1+ns_2}{1+n}$ where T and s = temperature and specific humidity of the mixture; T_1 and T_2 = temperature, s_1 and s_2 = specific humidity, m_1 and m_2 masses of displaced air volumes and $n=m_2/m_1$ relative mass of displaced air volume, the author develops the expression

$$\delta^*\frac{1}{RT}\left\{B(T-T_1)-0.622\,[E(T)-E(\tau_1)]\right\}$$

according to which the water content of a cloud depends upon three parameters, namely: B, T_1 and τ_1. For tabulating this equation, δ^* is given in the form of a difference $\delta^*=\delta_T-\delta_\tau$ where $\delta_T=\frac{B}{RT}(T-T_1)$ and $\delta_\tau=\frac{0.622}{RT}\,[E(T)-E(\delta_1)]$ magnitudes depending upon B and T, and B and τ, respectively. The results of computation of δ_T and δ_τ are presented in diagrams. In these equations τ = the minimum value of the dew point (ice); E = maximum tension of water vapor; $B=P\left(\frac{s_2-s_1}{T_2-T_1}\right)$ or $\frac{0.622}{AR_n}\frac{LE}{T^2}$ where $AR_n=0.11$ cal/g deg. *Subject Headings:* **1. Cloud formation 2. Water content of clouds 3. Contrail formation.**—*I.L.D.*

11.9–307 551.576.11:551.521.18

Feĭgel'son, E. M., **Vliianie oblakov na teplovoĭ rezhim atmosfery.** [Influence of the clouds on the thermal regime of the atmosphere.] *Akademiia Nauk SSSR. Geofizicheskiĭ Institut, Trudy*, No. 37(164):62–88, **1956.** 7 figs., 2 tables, 3 refs., 57 eqs. **DLC**—A theoretical mathematical investigation of the influence of water droplets in clouds upon the transmission of radiant energy through clouds and upon the distribution of temperature within clouds as a result of the radiational regime. The cloud is considered as a whole. The dispersion and absorption of long wave radiation in clouds, the characteristics of the passage of solar radiation through a cloudy atmosphere and also the selective nature of absorption of water vapor outside clouds are considered. The theoretical calculation of the following is carried out: pure extinction in cloud by day; pure extinction in the cloud by night (without solar radiational flux); scattering and extinction in clouds by night in the case of spherical scattering indices; pure extinction in clouds in the case of selective absorption by water vapor outside clouds by night. These are compared with the distribution of temperature at night in a cloudless atmosphere with $\alpha=1$ cm²/g and also in an atmosphere with a thin cloud layer ($\tau_0=5$) which absorbs and scatters long wave radiation. *Subject Headings:* **1. Cloud effects on radiation 2. Infrared radiation through clouds 3. Infrared radiation transmission.**—*I.L.D.*

PRECIPITATION

See also: **Drought indexes** (Kulik), 11.9–47; **Frontal type precip., Bulgaria** (Martinov), 11.9–263; **Pressure effects on precip.** (Godev), 11.9–282.

11.9–308 551.579.4:551.577.2/3(713)

Bruce, J. P., **Rainfall intensity-duration-frequency data for Toronto, Ontario. Canada.** *Meteorological Branch, CIR-3030*; TEC-267, April 9, **1958.** 8 p. 2 figs., 2 tables, 14 refs. **DWB, DLC**—The immediate purpose of this study was to aid in defining the flood intensity-frequency regime of Black Creek in Toronto, Ontario, for a proposed flood control scheme. Necessary data were available from the Meteorological Service, obtained since 1917, at Meteorological Headquarters. The statistical significance of "return period" should be kept in mind. The present study illustrates the way in which the convenient nomograms and relationships may be used and also provides rainfall intensity-duration frequency data for Toronto. The results obtained are presented in tables and figures. *Subject Headings:* **1. Rainfall depth-duration frequencies 2. Flood intensity-frequency regime 3. Toronto, Ontario.**—*E.K.*

11.9–309 551.577.32:551.578.1:551.578.4(43)

*Dammann, W. (*Frankfurt a.M.*), **Untersuchung über Schwankungen der Winterniederschläge in Deutschland.** [Investigations on the variations of winter precipitation in Ger-

many.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 10(1):17–37, **1959.** 6 figs., 5 tables, 2 refs. German, English and French summaries p. 17–18. **DWB, DLC. Comment** by F. Baur in *Ibid.*, 10(3):422–424, **1960.** –The present paper deals with the fluctuations of winter precipitation in Germany and continues former studies of the same author about the trends of summer precipitation and other climatic elements. It is based on two series of northern and southern Germany, derived each from 36 stations. Overlapping means of 5 years show quasi-periodical variations for days with frost or rain similar to the 11 year sunspot cycle. Overlapping means of 11 years show a marked period of 33 years which may correspond to the Bruckner cycle. This is equally well-pronounced for the amount of precipitation, for the number of precipitation days and for the precipitation density, but not, however, for the number of days with snowfall. The divergent pattern of the latter can be compared with a variation of the large scale displacement of air masses over Germany. As to the precipitation variations in winter, no clue for a continuous and reinforcing cause could be found which could justify the hypothesis of the progressive warming of the atmosphere owing to an increase of its carbonic acid content. *Subject Headings:* **1. Precipitation variations 2. Germany.**—*Author's abstract.*

11.9–310 551.577.34(521.1):551.577.32

Yaegashi, S., **On the secular variation of "the Baiu" precipitation in the southern part of Tohoku District in Japan.** *Sendai, Japan. Central Meteorological Observatory, Journal of Meteorological Research of Tohoku District*, Vol. 12, Memoir No. 5, March **1959.** 2 p. 2 figs., 5 refs. Reprint from *Tenki*, 5(3):81–82. In Japanese. **DWB**—The amount of Bai-u precipitation in the Tohoku district is analyzed. Tohoku District is the northern limit of Bai-u. The Bai-u precipitation in the northern Tohoku District, in such areas as Aomori, Akida and Miyago, has a significant difference of secular variation of Bai-u precipitation in June and July, while the southern district, such areas as Ishimaki, Yamagata and Fukushima, has almost the same trend of variation. The southern Tohoku District seems to have a Bai-u cycle of 50–60 yrs. The current years are in the heavy rainfall period. The eleven year Bai-u cycle corresponds neatly with the opposing phase of the sunspot cycle. The 7–9 yr Bai-u cycle corresponds with the southward or northward shifting of the Pacific high and the water temperature of the Misasagi sea. *Subject Headings:* **1. Bai-u 2. Secular precipitation variations 3. Precipitation trends 4. Tohoku District, Japan.**—*J. H. Woo.*

11.9–311 551.577.38(746):628.1

Almquist, Frederick O. A. (*Sanitary Engr., State Dept. of Health, Hartford, Conn.*), **Public water supplies of Connecticut during the 1957 drought.** *New England Water Works Association, Journal*, 73(1):1–14, March **1959.** table, form. **DWB, DLC**—During the drought of 1957 in Connecticut, the data on the annual rainfall of Hartford, New Haven and Bridgeport were 35.30 in., 38.12 in. and 38.53 in., respectively, as compared to a normal of 42.53 in., 45.10 in. and 47.57 in. at the respective stations. The general effect on water supply and the experiences of several utilities in the state are discussed. *Subject Headings:* **1. Drought, Connecticut (1957) 2. Precipitation deficiency 3. Water supply 4. Connecticut.**—*N.N.*

11.9–312 551.577.38:551.577.32(728.4)

*Portig, W. (*San Salvador*), **Über die Trockenzeit von San Salvador, Mittelamerika.** [The dry season in San Salvador, Central America.] *Meteorologische Rundschau*, Berlin, 11(3):80–85, May/June **1958.** 3 figs., tables, 5 refs., eqs. **DWB, DLC**—A detailed analysis of the precipitation characteristics of the dry season in San Salvador on the basis of rainfall data for the period 1918–1956. The dry season extends from November to April with maxima exceeding 100 mm (511 mm in November) at both bounding months. Daily frequencies exceeding 80 mm but not 100 mm were recorded in the dry months. In this interval the number of rainless days was 6407 and that of rainy days 661. The relationship of rain-free to rainy days shows an asymmetry between the beginning and end of the season, the center of gravity of the dry season being on Feb. 7. While both rain amounts and frequencies are asymmetrical in the dry season, the rainfall intensity shows a periodicity of more than $3\frac{3}{4}$ and less than 4 yrs. A detailed analysis is made of the secular variation of rainfall amounts and intensities, of the duration of the dry season, and of the dates of beginning and end of the dry season. The

validity of the various periods of rainfall amounts and intensities is examined. A synoptic analysis of two dry periods, April 1920 and April 1927 (the former without rain and the latter with 16 days of rain) is presented. An analysis of the pressure fields indicates that in dry weather San Salvador lies near the axis of a low pressure trough extending southeastwards, while in wet weather it lies in the trades. Since the mountains north and south of San Salvador exert a rain diminishing effect upon east winds and a rain increasing effect upon west winds, the weather aloft differs considerably from the surface weather. The dry April showed regions of marked pressure rise and fall which moved west to east at a rate of 10° of longitude per day; the pressure changes of the wet April were much more diffuse, only rarely identifiable from day to day. Data on the precipitation amounts, intensities, duration of dry periods, etc., are presented in tables, graphs and in the text. *Subject Headings:* **1. Annual rainfall variations 2. Dry season 3. San Salvador.**—*I.L.D.*

RAIN, SNOW AND HAIL

See also: **Hail prevention, France** (Dessens), 11.9–232; **Magnesium antimonide effects on supercooled clouds** (Gol'tiakov, Krasikov), 11.9–303; **Water content of clouds** (Matveev), 11.9–306; **Winter precip., Germany** (Dammann), 11.9–309; **Esker microclimat., Finland** (Okko), 11.9–324; **Snow drift microclimates** (Billings, Bliss), 11.9–325.

11.9–313 551.578.11:531.32

Ĭordanov, D., **O skorosti i deformatsii padaiushchikh v vozdukhe vodianykh kapel'.** [Velocity and deformation of water drops falling through the air.] *Bŭlgarska Akademiia na Naukite, Sofia, Doklady,* 12(3):191–193, May/June, **1959.** fig., 6 refs., 6 eqs. English summary p. 193. **DLC**—In examining the deformation of water drops, noticeable at an equivalent radius of more than 0.05 cm, the drop's flow must be viewed, not potentially, but with the separation of the boundary layer. In such a case the velocity of the drop obtained from the solution of a system of equations

$$Re = \frac{2eRU}{\mu}; \qquad \frac{4}{3}\pi a_0^3 g = \frac{1}{2} C_d \pi e R^2 U^2$$

$$\frac{4}{3}\pi a_0^3 = 2.9856\,\frac{\pi R^3}{3} + \frac{\pi}{2}\int_0^{0.8820R^2} \frac{(kn+k_1n^2)dn}{\sqrt{1-(k^2n+2kk_1n^2+k_1^2n^3)}}$$

and form

$$x - 0.3420R = -\frac{1}{2}\int_{0.8820R^2}^{v^2} \frac{(k+k_1n)dn}{\sqrt{1-(k^2n+2kk_1n^2+k_1^2n^3)}}$$

where

$$k = \frac{1}{R} - \frac{0.7}{y}\frac{eU^2}{2} \qquad k_1 = \frac{0.45}{yR^2}\frac{eU^2}{2}$$

conforms to the experimental data. *Subject Headings:* **1. Drop velocities 2. Raindrop distortion.**—*Author's summary.*

11.9–314 551.578.46(497.1)

*Kirigin, Bozidar, **Snježni Pokrivač u Zagrebu Prema Podacima Opservatorija Zagreb-Grič.** [Snow cover in Zagreb according to data from Zagreb-Grič Observatory.] *Zagreb, Yugoslavia. Hidrometeoroloski Zavod NR Hrvatske, Rasprave i Prikazi,* 8(2), **1957.** 27 p. 14 figs., 10 tables, 4 refs. German summary p. 21–24. Added t-p. in German. **DWB, DLC**—A comprehensive study of the snow cover characteristics in Zagreb based upon observations carried out at the Zagreb-Grič Observatory during the period 1911/12–1952/53. Data are presented on the maximum and minimum days with snow cover for individual months and years, the duration of snow cover in days, annual variation of mean daily snow depth and of mean number of days with a given snow depth, mean number of days with given snow depth, etc. The determination of winters with much or little snow on the basis of daily snow depths and the determination of the proportion of snow fall in total precipitation are discussed with

the aid of numerical data. *Subject Headings:* **1. Snow cover data 2. Zagreb, Yugoslavia.** —*I.L.D.*

11.9–315 551.578.46(472)

Shul'gin, A. M., **Mesiats naibol'sheĭ vysoty snezhnogo pokrova.** [The month of maximum snow cover depth.] *Priroda*, 47(3):124–125, March **1958. DLC**—The greatest depth of snow cover typical for the northeastern regions of European U.S.S.R. and the northern districts of western Siberia amounts to 90 cm and more. The least snow depth (less than 10 cm) occurs in the steppe zone, semideserts and deserts of Central Asia. In the principal regions the maximum depth is in March and only in the south is it in February. The maximum density is attained in March (0.3–0.4 g/cm^3). The artificial accumulation of snow heaps as a source of future soil moisture supply is discussed and the modification of soil climate in the Altai territory is described. *Subject Headings:* **1. Snow cover data 2. U.S.S.R.**—*I.L.D.*

11.9–316 551.578.46:629.111.7(498)

Tistea, D. and Grigore, M., **Intervalul cu strat de zăpadă, favorabil drumului de sanie.** [Snow cover interval favorable to sledge trails in Romania.] *Meteorologia Hidrologia şi Gospodarirea Apelor*, Bucharest, 3(2/3):35–38, **1958.** 2 figs., table, 3 refs. English summary p. 137. **DWB**—The paper presents a brief account of the sledge trails in the Romanian territory as a climatological characteristic. The observation material has been treated according to the methods of the Soviet climatologists A. A. Kaminskiĭ and E. S. Rubinshteĭn. The maps are only an attempt at a cartographical picture of this characteristic. *Subject Headings:* **1. Snow cover charts 2. Sledge trails 3. Romania.**—*Authors' abstract.*

11.9–317 551.578.46(71)

Williams, G. P. (*Snow & Ice Section, Div. of Building Res., Natl. Res. Council, Canada*), **Compactibility of newly fallen snow in Eastern Canada.** *Journal of Glaciology*, Cambridge, 3(24):257–260, Oct. **1958.** 2 figs., table, 13 refs., eqs. English and French summaries p. 257. **DWB, DLC**—The qualitative behavior of a snow mass rather than its individual constituents is essential for engineering projects. A simple drop-weight method applicable under different field and climatic conditions was tested on dry snow in the winters of 1956 and 1957 at the Montreal Road Laboratories, Ottawa, and at the University of New Brunswick, Fredericton, Canada. The "critical density" of snow is treated, the experimental procedure is described and the results are given. When the undisturbed density and snow temperature are known, the compacted density can be estimated within ±0.025 gm/cm^3 in 70%. Also it was found that the compacted density is conversely proportional to the small proportion of fine granular snow. *Subject Headings:* **1. Snow cover density 2. Eastern Canada.**—*W.N.*

HYDROMETEOROLOGY

See also: **Sec. F2,** p. 1430; **Drought indexes** (Kulik), 11.9–47; **Water levels** (Graham, Satterlund), 11.9–50; **Soil moisture content-albedo relationships** (Maruyama, Koshimura), 11.9–273; **Flood intensity-frequency regime** (Bruce), 11.9–308.

11.9–318 551.579:628.1:061.3(470)

Popova, K. L., **Koordinatsionnoe soveshchanie po voprosam vodnogo khoziaĭstva.** [Coordinating conference on problems of water resources.] *Meteorologiia i Gidrologiia*, Leningrad, No. 7:59–60, July **1959. DWB, DLC**—Conference on problems of water resources was organized in 1958 at the Division of Technical Sciences of the Academy of Science of the U.S.S.R. Main functions of the conference were related to the coordination, generalization and direction of the scientific research works carried on in the institutes and other branches of the Academy of Science of the U.S.S.R. Five reports on the activities of various members in the field of water resources were briefly outlined. Summarized plan on the scientific research in 1958 on various water problems in coordinated into the "combined use of water resources," which contains about 300 different topics prepared by 78 organizations. This publication includes the following subjects: 1) Studies of basic facts for the use of water resources, 2) Study of

estuary processes, 3) Hydro-mechanization of ground and mining works and 4) Studies relate to the development of standards and technical regulations in the field of water utilizatio *Subject Headings:* **1. Hydrologic conferences 2. Water supply 3. U.S.S.R.**—*N.P.S.*

11.9–319 551.579:551.311.2:551.437(43

Priehäusser, Georg, **Die geomorphologischen Grundlagen der Wasserspeicherung i Einzugsgebiet des Schwarzen Regen.** [Geomorphological bases of water storage in th catchment area of the Black Regen River (Bavaria).] *Arbeitskreis "Wald und Wasser, Mitteilungen*, Coblenz, No. 3:37–45, **1959.** 12 figs. **DWB** (M:634.9 A664mi)—The content of this paper comprise the following, viz: the geological history of the principal rocks namel magmatites and metamorphoral rocks, the formation of storage spaces; the factors determinin the erosion of the fundamental rock; the formation of the landscape, the role of snow, wate frost leaving glacial sculpturing etc. The discussion is accompanied by numerous diagram *Subject Headings:* **1. Water conservation 2. Hydrology 3. Geomorphology 4. Black Rege River, Bavaria, Germany.**—*I.L.D.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See also: **Climat. res., France** (Urbain), 11.9-27; **Phenological climat.** (Schnelle), 11.9–197.

11.9–320 551.58:551.

Miller, David H. (*Quartermaster Research and Dev. Center*), **What climatologists need fro other geographers.** *Professional Geographer*, Wash., D. C., 9(4):8–10, July **1957.** 7 ref **DLC**—In connection with a discussion dealing with the relations between climatology and th study of visible landscape phenomena such as landforms, streams, etc., stress was placed upo the obligations of climatology to other fields of study in geography where the author point out the objective of climatology both as an aid to other disciplines and as a self-contained stud and calls attention to the dependence of climatology upon other fields of study. This de pendence is illustrated by the problem of heat balance on the solution of which geography ca supply information on terrain characteristics, heat storage of soil, albedo, roughness, wate the slope parameters, etc. *Subject Heading:* **1. Climatology-geography relationships.**—*I.L.D.*

CLIMATE OF PARTICULAR PLACES

See also: **Climat. data, Norway,** 11.9 36; **Climate, Askaniia-Nova** (Babich), 11.9–41; **Climate, Brit. Isles** (Booth), 11.9–194.

11.9–321 551.582.2(57) 551.586:61

Schaefer, Helmut, **Wetterbeobachtungen in Workuta.** [Weather observations at Vo kuta.] *Polarforschung*, Ser. 3, Kiel, 25(1/2):332–336, 1955, publ. **1958.** 6 refs. **DLC**— Vorkuta is a Soviet coal district at 67.5°N, 64°E, 70–120 m.a.s. where the author spent fiv years in various prison camps. The climate is characterized as being dangerous to the hear nerves and the circulatory system; sudden pressure jumps are particularly taxing. Th barometer falls by 20–30 mm in a few hours and the weather changes from one extreme t another several times a day. Precipitation is 300–400 mm annually and the mean temperatur is between −6 and −7°C, maximum +30°C, minimum −55°C. July is the only mont without night frost −10 to −20°C; winter lasts from the end of September to the end of Apri January is the coldest and February the stormiest month; first snow is in October. Sno depth is 60–80 cm. The "purga," a snowstorm of 2–3 days duration, occurs 20 times a yea (17 times from S. W.). The true purga from the N., although with little or no snowfall, i very severe. It has a wind speed of 30 m/sec at −40 to −45°C and blows the ground sno lessening visibility and making it difficult to breathe. *Subject Headings:* **1. Climate of Vorkut 2. Severe winters 3. Pressure jump 4. Physiological climatology 5. Vorkuta, Nenet National District, U.S.S.R.**—*W.N.*

CLIMATIC CHANGES

See also: **Historic climates, Brit. Isles** (Oliver), 11.9–196.

11.9–322 551.583.3

Ogden, J. Gordon, III, **Late-glacial pollen sequence from Martha's Vineyard, Massachusetts.** *American Journal of Science*, New Haven, Conn., 257(5):366–381, May **1959.** 3 figs., 2 tables, 31 refs. **DWB** —The Wisconsin post-glaciation climatic and vegetational changes of New England have been established in northern Maine, central Massachusetts, and southern New England by pollen-stratigraphic studies. Correlation of equivalent pollen horizons provides an internally consistent history of the climate and vegetation since deglaciation. Radiocarbon dates from specific horizons permit the correlation of the regional chronology with the glacial sequence in other parts of North America and Europe. Pollen analysis of a late-glacial sediment core from the island of Martha's Vineyard, Mass. includes the two major cold periods (corresponding to the Valders and Port Huron ice readvances in the Great Lakes region) recognized from other New England pollen diagrams. In addition, a third, older, cold period is recognized on Martha's Vineyard. This cold time is correlated with the emplacement of the Buzzards Bay moraine 5 mi to the north of the core site. The pollen record during the period of ice advance that built the Buzzards Bay moraine shows an absolute minimum of total tree pollen (as low as 10%) and indicates the presence of a number of high-Arctic plants, at least one of which (*Ameria sibirica, Turez.*) is apparently restricted to true Arctic tundra today. A change in the size-frequency distribution of pine pollen suggests that white and red pine pollen types replaced jack pine pollen types on Martha's Vineyard approximately 1000 yrs before a similar change was recorded in central Massachusetts. *Subject Headings:* **1. Postglacial climates 2. Radiocarbon dating 3. Martha's Vineyard, Mass.** *Author's abstract.*

11.9–323 551.583.3:551.311.1(99)

Péwé, Troy L. (*Glacial Geologist, USNCIIGY, College, Alaska*), **Quaternary glaciation: McMurdo Sound region.** *American Geophysical Union, Transactions*, 39(4):787–789, Aug. **1958.** fig. **DWB, DLC**—In an attempt to study the history of the Antarctic ice cap, the meteorologists have gathered data on the whole range of ice-air-sun relationships. Glacial history has been traced and discussed under the following subheadings of the three major Quaternary glaciations: the oldest glaciation, the intermediate and the most recent glaciations. From the McMurdo Sound region, examination of the glacial deposits, it has been concluded that both the Alpine and outlet glaciers do fluctuate in their thickness and extent. *Subject Headings:* **1. Quaternary glaciation 2. McMurdo Sound, Antarctica.**—*N.N.*

MICROCLIMATOLOGY

See also: **Potato field microclimat.** (Dubinskiĭ), 11.9-42; **Forest micromet.** (Rasche), 11.9–48; **Forest microclimat.** (Ross), 11.9-49; **Local climates** (Parry), 11.9-61; **Environmental influences on crops** (King), 11.9–213.

11.9–324 551.584.34:551.578.466(480)

†Okko, Veikko, **On the thermal behaviour of some Finnish Eskers.** *Fennia*, Helsinki, 81(5), **1957.** 38 p. 19 figs., 27 refs. **DWB** (PV.81:1958)—The author discusses the snowless patches that occur in south and central Bothnia, as well as in latitudes south of the 62nd (Finland). To the north of the 62nd lat., at 2°41′, 63°10′ and 63°21′ snowless patches have been observed at different communes. A detailed result is given on the microclimate, the effects of air circulation during the summer and winter, and other phenomena of the Finnish Esker. *Subject Headings:* **1. Esker microclimatology 2. Finland.**—*N.N.*

11.9–325 551.584.34:551.578.466:581.5

Billings, W. D. and Bliss, L. C. (*Duke Univ. and Univ. of Illinois*), **An alpine snowbank environment and its effects on vegetation, plant development, and productivity.** *Ecology*,

Durham, N. C., 40(3):388–397, July 1959. 2 figs. (incl. photo), 6 tables, 7 refs. **DWB, DLC**—In this study of an alpine snowbank environment and its effect on vegetation, plant development and net plant production in the Snowy Range of the Medicine Bow Mountains of Wyoming during the summers of 1954 and 1955, two microenvironmental stations were established at the snowbank: one above and the other at the base of the bank. Air and soil temperature, vapor pressure deficit, solar radiation, soil moisture and wind were measured. Time lines marking the outer limits of the bank were painted each week. And observations along these lines included plant phenology, clippings of single plants and vegetation for productivity estimates, soil and air temperature and soil moisture. Air and soil temperature were quite low throughout the growing season although temperature rose considerably following the snow melt. Differences in temperature and vapor pressure deficit were small between the upper and lower end of the bank and probably have little effect on vegetation differences. Soil moisture seems to be the most critical factor affecting vegetational differences above and below the bank. Wind velocity is less in the snowbank area than on the surrounding land. Marked floristic vegetational differences were found along a gradient from the area released from snow in June to the areas uncovered in mid-July. These floristic differences are the result of differing tolerances of the species to drought and shortness of growing season. Productivity of snow bank vegetation is related more closely to high available soil moisture and relatively early release from snow. Late release dates provide too short a growing season for good plant and soil development. *Subject Headings:* **1. Alpine microclimatology 2. Snow drift microclimates 3. Ecology.**—*Based on author's summary (I.L.D.).*

11.9–326 551.584.43:551.574.41

†Steubing, L. and Casperson, G., **Pflanzentemperatur und Taubeschlag.** [Plant temperature and dew deposits.] *Angewandte Meteorologie*, Berlin, 3(7):219–224, June **1959.** 8 figs., table, 22 refs. German summary p. 219. **DLC**—In this study of the relationship between plant temperature and dew cover, the night temperature variation on the surface of leaves and shoots and the air temperatures 5 cm above the leaf surface was measured thermoelectrically by an apparatus devised by G. Casperson (*Zeitschrift f. Botanik*, 47:433, **1957**). The apparatus is illustrated by a diagram and the method of measurement is described. The results of measurements of leaf and air temperatures and of deposits on *Chenopodium album* (white goose's foot), *Digitaria sanguinalis* (crab grass) and *Trifolium repens* (white clover) are presented in a table and graph. By means of a study of a leaf model it is shown that a long leaf is up to 2°C cooler than a broad leaf and shows a better dew deposit than the latter. The height of the dew deposit is influenced considerably by the position of the dew catcher. When the sun's rays strike the dew-moist leaves in the early morning hours the condensed water begins to evaporate; and evaporation is more rapid on the under side of the leaf, which has a small dew deposit, than on the upper side. Roughness of the leaf or of the bud surface reduces thermal microturbulence and reduces mass exchange. By creating microspaces without air movement, the needles of cacti, for example, create favorable conditions for radiation during the night and hence intensify dew deposition. Graphs showing the influence of dew upon the temperature variation of the upper and lower surface of the strawberry, the temperature variation of the tissue of the middle and of the tip of a spine of *Echinocactus grusonii* at beginning of radiation and the temperature variation of the stem of green beans are presented. *Subject Headings:* **1. Plant temperature measurement techniques 2. Dew investigations.**—*I.L.D.*

11.9–327 551.584.6:629.123.4 551.586:612.014.4

Bullig, H. J. (*Marine Weather Bur., German Met. Serv.*), **The development of a hold climate and of sweating in the hold and of its cargo.** *Marine Observer*, London, 29(184):61–72, April **1959.** 5 figs., 4 photos. **DLC**—Extracts from a paper read at the Conference on the Meteorology of Cargo Holds, held at Hamburg on June 20, 1956 under the auspices of the Seewetteramt, Deutscher Wetterdienst. Condensation phenomena, behavior of closed holds and main climatological danger zones are among the subjects discussed. *Subject Heading:* **1. Ships' hold climates.**

CLIMATIC CLASSIFICATION

See also: **Steppe climate** (Babich), 11.9–41.

11.9–328 551.585(573)

†Kolesnikov, B. P., **Prirodnoe raĭonirovanie Primorskogo kraia.** [Natural regionalization of the Maritime Province.] (In: Akademiia Nauk SSSR. Dal'nevostochnyĭ Filial, Vladivostok. Institut Geografii, **Materialy po fizicheskoĭ geografii iuga Dal'nego Vostoka.** Moscow, Akademiia Nauk SSSR, **1958.** p. 5–30. fig., 51 refs.) **DWB** (551.4 A313ma)—Earlier classifications of the natural regions of the Maritime Province are reviewed, special attention being given to the work of L. S. Berg and V. L. Komarov, who used bioclimatological and geomorphological factors as a basis for their classifications. In this article, a classification along these lines is presented, making use of original materials collected in the Far East during 1947–53, as well as all published data. The area is divided into several regions and subregions, and for each of these, in addition to information on the physical relief, vegetation, etc., data are given concerning some of the most salient climatic characteristics, expressed in terms of temperature extremes, precipitation amounts, duration and depth of snowcover, remarks on foggy areas, etc. However, no systematic tables of climatic data are included. *Subject Headings:* **1. Climatic classifications 2. Maritime Territory, Asiatic U.S.S.R.**—*R. S. Quiroz.*

BIOCLIMATOLOGY

See also: **Medical met. symposia** (Jungmann), 11.9–52; **Weather effects on diseases** (Picko), 11.9–53; **Heating of houses** (Parry), 11.9–61; **Heat loss from swimming pools** (Root), 11.9–62; **Environmental influences on crops** (King), 11.9–213; **Physico-chem. effects of weather** (Bortels), 11.9–281; **Physiological climat.** (Schaefer), 11.9–321; **Ships' hold climates** (Bullig), 11.9–327.

11.9–329 551.586:58

Marcello, A. (*Italy*), **Climate, plant migration and rhythm.** *International Journal of Bioclimatology and Biometeorology*, Leiden, Netherlands, Vol. 2 (Pt. 2), **1958.** 3 p. **DWB**—Every plant has a specific rhythm which is related to the selective action of the environment of its place of origin. This specific period is marked by the cycle. The rhythm of plants varies according to its tolerance of changes in its environment. Plants may be classified as palaeorhythmic, and neorhythmic; in the former the rhythm is influenced by the environment but in the latter it is not. Each plant and each community can exist only in the potential area, that is in the total area that a species or community may occupy according to its tolerance. The tolerance of a species is subject to the laws and processes of organic evolution so that a plant or species can exist or reproduce successfully only when the range of physiological rhythm agrees with a definite range of climatic or edaphic conditions. Phenological research on plant communities, which is termed eymphenological, emphasizes that every plant community has its own potential area and tolerance. The individual plant or phenoid appears to be much freer than the plant that forms part of a community where the plants appear at temporally different stages of vegetation and flower, for example, as *epiphanae*, *mesophanae*, or *hypophanae*. To the concept of action or reaction should be added that of interaction, that is an action inserted among the actions and reactions of all other plants belonging to a community. The distribution of plants is controlled primarily by climatic factors and secondarily by edaphic ones. Climate acts directly upon plants by transforming the specific period. Rhythm as well as tolerance has a genetical basis. Two rhythms are recognized: namely, the phenological rhythm of the physiological physiognomy and the rhythm of the growth and developmental stages. *Subject Heading:* **1. Plant bioclimatology.**—*I.L.D.*

11.9–330 551.586:631.5

*Nuttonson, M. Y. (*U. S.*), **The role of bioclimatology in agriculture with special reference to the use of thermal and photothermal requirements of pure-line varieties of plants as a biological indicator in ascertaining climatic analogues (Homoclimes).** *International Journal of Bioclimatology and Biometeorology*, Leiden, Netherlands, Vol. 2 (Pt. 2), **1958.** 8 p. 8 tables, 11 charts. **DWB**—The application of bioclimatology to the study of the growth and develop-

ment of physiology, farm crops and their thermal and photothermal requirements, and to the study of the agroclimatologically similar areas of the world, is illustrated. In this procedure each geographical region is regarded as consisting of certain macro- and microclimatic areas, each with particular organisms and eco-types. In spite of the dissimilarities in microclimatic conditions over a given area about a weather station, standard observations of temperature provide adequate data for establishing correlations with plant growth and development. The thermal and photoperiodic requirements of a plant variety under uncontrolled field conditions are determined by assembling phenological data for genetically homogeneous varieties. The interval between two phenological events of a variety during the same season in various locations of similar climatic and latitudinal conditions is the summation of day-degrees or summations of heat-units. With the aid of charts and tables, the author discusses the year-to-year day-degree summations for given localities in the U. S., Canada, Russia and Finland; day-degree summations for various localities within a narrow latitudinal range as illustrated by selected stations in Czechoslovakia; day-degree summations and photothermal units for various localities within a wide latitudinal range (growth of Thatcher and Marquis wheat over a wide latitudinal range in North America); day-degree summations and photothermal units for time of seeding study in one locality during a crop year; effects of latitude, altitude and soil moisture on day-degree summations; and cumulative day-degree growth development curves as a biological tool for ascertaining climatic analogues. An outline of important areas in agricultural bioclimatology requiring investigation is presented. *Subject Headings:* **1. Bioclimatology 2. Agroclimatic regions.**—*I.L.D.*

ENVIRONMENTAL INFLUENCES

See: **Forest temps.** (Rasche), 11.9–48; **Urban influences on SO_2 distribution in air** (Bangerl, Steinhauser), 11.9–238; **Continentality and cold poles** (Parmuzin), 11.9–276.

SYNOPTIC CLIMATOLOGY

See: **Synoptic climat., U.S.S.R.** (Bliumina), 11.9–16.

MISCELLANEOUS

COSMIC INFLUENCES

See: **Sec. C2,** p. 1400; **Meteor trail distortion** (Manning), 11.9–103; **Meteor trails** (Manning), 11.9–104; **Interstellar and interplanetary dust** (Fesenkov), 11.9–143.

VISIBILITY

11.9–331 551.591.31/32(234.539)

Weigel, Werner, **Der tägliche und jährliche Gang der Sicht auf dem Brocken und auf dem Fichtelberg in den Jahren 1950 bis 1955.** [The diurnal and annual variation of visibility of the Brocken and Fichtelberg in the period 1950–1955.] *Zeitschrift für Meteorologie*, Berlin, 12(9/10):273–295, Sept./Oct. **1958.** 6 figs., 9 tables. **DWB, DLC**—The daily synoptic records of visibility made at 8 fixed intervals a day over a six year period at the mountain stations of Brocken and Fichtelberg are presented in tables and graphs according to the annual and monthly frequencies of particular ranges of visibility at the fixed periods of observation. These visibility ranges are combined under groups of "cloud," "haze" and "good visibility" and are represented in isopleths. Similarly the observations of objects at distances of 50 and 150 km for the years 1953–56 are represented in isopleths of annual and daily variations of the percent of potential visibility at the time of observation. *Subject Headings:* **1. Visibility variations 2. Annual visibility variations 3. Brocken Mt., Germany 4. Fichtelberg Mt., Germany.** —*I.L.D.*

OPTICAL PHENOMENA

See also: **Atmos. optics,** 11.9–28; **Luminescence of moon** (Kozyrev), 11.9–91.

11.9–332 551.593.55:535.33:546.33

Cooper, C. Dewey, **Spectrographic data obtained from sodium and cesium clouds in the upper atmosphere.** Georgia. Univ. Dept. of Physics, Contract AF 19(604)-1562, Final Report, Dec. 11, 1959. p. 1–4. refs. Also his **Spectra of argon oxide, krypton oxide and xenon oxide.** p. 5–11. refs., tables. (Appendices, reprints from Jr. of Geophysical Research and Physical Review, abstracted separately.)—I. Spectrographic Data obtained from sodium and cesium clouds in the upper atmosphere. Spectrographic evidence is provided for the resonant scattering of sunlight by a sodium cloud which was placed in the upper atmosphere at twilight. The relative intensity of the 5893 A and 3303 A sodium lines provides conclusive results that the sodium twilight flash results from resonant scattering of sunlight. In similar experiments, cesium clouds radiate resonant lines at 8525 A, 4593 A, 4555 A, 3876 A and 3611 A. II. Spectra of Argon Oxide, Krypton Oxide, and Xenon Oxide. When traces of oxygen are added to one atmosphere of argon, krypton, or xenon and each mixture is excited in a discharge tube, characteristic spectra appear near the 5577 A ($^1S_0 - {}^1D_0$) line. These spectra are associated with rare-gas oxygen molecules which may be formed with oxygen in the $^1S_0$ or $^1D_0$ state. A vibrational analysis was not found for the ArO and KrO spectra but the XeO bands are represented by $+20097+142v'-9.9v'^2+0.1v'^3-(360v'-12v''^2)$. Many of the rotational lines of these bands have been resolved, but the overlapping of bands has prevented a complete rotational analysis. *Subject Headings:* **1. Sodium in upper atmosphere 2. Twilight phenomena.**—*Author's abstracts.*

11.9–333 535.3:551.593.1:551.575.1 551.508.953

Arnulf, Albert; Bricard, Jean; Curé, Emile and Veret, Claude, **Recherches sur la transmission de la lumière par la brume et par le brouillard.** [Research on the transmission of light by haze and fog.] *Revue d'Optique,* Paris, 38(3):105–133, March 1959. 23 figs., 11 refs. 20 eqs. French and English summaries p. 105. **DLC**—An optical system for determination of transmission factors in haze and fog for various wave lengths is developed and their calculation through the simultaneous specification of atmospheric constitution is reported. The first part describes the spectrometer associated with a receiver consisting of a thermopile designed for the range 0.3 to 13μ and giving the transmission factor in direct value. In addition, two visual photometers allowing similar measurements in the visible region are presented. Data from the various methods are discussed. The second part describes the methods used to get an absolute granulometric measurement of scattering particles in suspension. Optical measurements are explained by means of such granulometric processes on the basis of theoretical considerations. *Subject Headings:* **1. Light transmission data 2. Spectrometers 3. Photometers 4. Transparency of haze and fog 5. Dust haze.**—*Authors' abstract.*

ELECTRICAL PHENOMENA

See: **Sec. D2,** p. 1413; **Electron density variations** (Dominici), 11.9–241; **Ionos. polarization** (Mechtly), 11.9–245.

AURORAS

See: **Sec. D3,** p. 1415.

SFERICS

See also: **Sferics sources** (Obayashi), 11.9–54.

11.9–334 551.594:6

Gherzi, E., **Some remarks on spherics recorded on 20 kc.** *Bulletin de Géophysique,* Montreal, No. 6:3–10, Oct. 1959. 4 figs., 8 refs. French summary, p. 3. **DWB** A con-

tinuous registration of night-time spherics (5 h p.m. to 8 h a.m. of the following day) on 20 kc has been obtained from March 1958 to Nov. 1958 and from April 1959 to Sept. 1959 at the Geophysical Observatory in Montreal and at the Geophysical Station at Loyola University, in New Orleans, from Nov. 1958 to March 1959. It is observed from the recordings that when a thundery cell is passing over the recording station the integrated discharges go continuously from the aero line to an oft-scale value. Yet, when the thundery center is passing at some distance (more than 100 km) from the geophysical observatory, the integrated curve of the spherics shows typical undulations. The pen of the Angus recorder does not come back to rest, but remains recording above the zero line. Hence the problem: why does the distance of the recorded waving from the aero rest line vary according to the distance of the active atmospheric center? The present paper reproduces the pertinent recordings graphically and discusses the problem in the light of various proposed explanations of this phenomenon. *Subject Heading:* **1. Sferics records.**—*I.S.*

11.9–335 551.594.6:551.594.22

Takagi, Masumi; Isikawa, Haruzi and Takeuti, Tosio, **On the structures of flashes and atmospherics accompanied by cloud discharges.** *Nagoya. Univ. Univ. Research Institute of Atmospherics, Proceedings*, 6:1–16, Jan. **1959.** 16 figs., 5 tables, 12 refs. **DWB**—A new equipment has been designed to record the time variation of luminosity radiated from the discharge whose stroke channel is concealed in a thundercloud. This equipment together with the atmospheric wave form recorder has been employed to the observation of lightning activity. It has been found that the initiation of individual cloud discharges is governed by the statistical time lag of a spark breakdown, which is altered by the conditions of the cloud activity. In the early stage of a storm activity, the interval of successive discharges is short, and the scale of each discharge is generally small, so the luminosity accompanied is too weak to be recorded. In the last stage, most of discharges have considerable scales and emit strong flashes in spite of the very weak activity of the thundercloud. The luminosities of flashes can be classified into two groups in view of their durations, i.e. the weak luminosity with long duration and the pulse of strong luminosity. In the former, the luminosity continues during the greater part of the period of a cloud flash that discharges electricity in 0.2–0.8 second. In the latter, the pulses with durations of 0.8–2 ms are repeated irregularly at time intervals less than 10 ms and continue during the period of one discharge. The atmospheric waveform corresponding to each light pulse is an electro-static pulse when it is recorded in the vicinity of the origin or a group of differential pulses with rapid changes when it is caught in a distant place. *Subject Headings:* **1. Sferics structure 2. Sferics from lightning.**—*Authors' abstract.*

11.9–336 551.594.221:551.594.6:621.396.1

†Tepley, Lee R. (*Stanford Res. Inst., Menlo Park, Calif.*), **A comparison of sferics as observed in the very low frequency and extremely low frequency bands.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2315–2329, Dec. **1959.** 3 figs., 2 tables, 20 refs. **DLC**—A large number of sferics were photographically recorded in the very low frequency (VLF) and extremely low frequency (ELF) bands at a UCLA field station in Hawaii. From the characteristics VLF waveforms it was clear that the VLF signals were generated from lightning discharges. It was found that an observable ELF component (slow tail) followed the VLF component in almost all cases. It was also found that about one third of the sferics observed were ELF signals, similar in appearance to slow tails but not preceded by observable VLF oscillations. Peak amplitudes were measured for both the VLF and ELF components of almost 3000 sferics. The results were tabulated in groups according to (1) whether the sferics were recorded during the day or during the night, (2) whether the polarity of the initial excursion of the ELF signal was positive or negative, and (3) whether the VLF and ELF components appeared together or separately. Amplitude distribution histograms were plotted for all cases. For those sferics possessing both VLF and ELF components, the VLF to ELF peak amplitude ratios were also tabulated separately as in (1) and (2) above, and ratio-distribution histograms were plotted. The more important results obtained from the histograms were as follows: 1. No significant differences were found between the amplitude distributions for the ELF waveforms that were preceded by VLF oscillations and those that were not. Hence, it is probable that both groups were generated by lightning discharges. 2. For both daytime

and nighttime sferics the median value of the ELF amplitude was greater for ELF waveforms of positive polarity than for waveforms of negative polarity. 3. For both daytime and nighttime sferics the median value of the VLF/ELF peak-amplitude ratio was greater for ELF waveforms of negative polarity than for waveforms of positive polarity. 4. The polarity of the ELF waveform was predominantly negative at night and positive during the day (verified by a count of the polarities of almost 6000 additional ELF waveforms). An attempt is made to explain the experimental results in terms of known properties of lightning discharges, and some of the difficulties in making such an interpretation are indicated. *Subject Headings:* **1. Sferics from lightning 2. Sferics wave forms 3. Lightning discharges.**—*Author's abstract.*

PART II. ANNOTATED BIBLIOGRAPHY ON ROCKET METEOROLOGY

By: Elemer Kiss

INTRODUCTION

During the past 15 years rocketry has developed enormously and this development has created a new method for scientific research. Rocket research was further emphasized during the International Geophysical Year (1957–1958). The general fields of application of rockets include: meteorology, astronomy, astrophysics, astronautics, radio astronomy, cosmic rays, meteorites, geodesy, geomagnetism, ionospheric and upper atmospheric physics and chemistry, etc. This bibliography is limited to articles, monographs and collected works dealing with *meteorology* and *upper atmosphere*. To satisfy the wide interest in this rapidly developing field we have included, as far as possible, all significant literature on the meteorological use of rockets. The bulk of the literature was published during the period 1950–1960. However a few items dated earlier than 1950 have been included.

Meteorological research articles giving results of work using satellites have been omitted from this publication. This material is reserved for one or two bibliographies to be published in the near future.

Items herein are arranged chronologically and alphabetically by author within each year. Exceptions are items 11I–38, 11I–120, and 11I–142 in which articles were left in their original arrangement in order to keep those collections intact. Counting the separate articles in these three items, the total number of items covered in this bibliography is around 280. A guide to the subject matter covered will be found in the **Subject Outline** below; locations of areas where observations and measurements were conducted will be found in the **Geographic Outline.**

This bibliography was prepared for and with support from the Meteorological Working Group of the Inter-Range Instrumentation Group.

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1947–1949

11I–1 551.510.535:551.501.7:551.507.362.1

Beth, Eric Walter, **Discussion of a method for the investigation of pressure, temperature, average molecular weight, wind velocity and dissociation in the upper atmosphere.** *U. S. Air Force. Air Materiel Command, Report*, No. 5–10, July 22, **1947.** 39 p. tables. **DWB**—Details of theoretical method for calculating wind velocity, etc. from pressure and temperature data obtained during rocket flights to 100 km or so, based on data presented in paper by DOW and REIFMAN (1946). Effects of various atmospheric constituents, and determination of dissociation by this method also discussed. Effect of projectile is taken into consideration. (*Same item as* 3.10–32, Oct. 1952, *Met. Abstr.*) *Subject Headings:* **1. Rocket measurements 2. Upper atmosphere 3. Dissociation. I. Dow, W. G. II. Reifman, Alfred.**—*M.R.*

11I–2 551.510.41:551.510.53

Crackett, K. F.; Paneth, F. A. and Wilson, E. J., **Chemical composition of the stratosphere at 70 km height.** *Nature*, London, 164(4160):128–129, July 23, **1949.** 7 refs. **DLC**—Methods of sampling (using V-2 rockets) and analysis are described. Results of argon, helium and neon determinations are shown in a table. Concludes that chemical composition of stratosphere air at 70 km is practically the same as that of the troposphere. (*Same item as* 6E–188, May 1955, *Met. Abstr.*) *Subject Headings:* **1. Atmospheric composition 2. Stratospheric air sampling.**—*M.L.R.*

11I–3 551.506.7:551.507.362.1:551.521.17

Greenstein, Jesse L., **The upper atmosphere studied from rockets. A. Research programs.** (In: Gerard P. Kuiper (*ed.*), **Atmospheres of the earth and planets.** Chicago, University of Chicago Press, [1949]. p. 112–125. 4 figs., table, 15 refs., 4 eqs.) Clearman, H. E., **B. The ultraviolet solar spectrum.** *Ibid.*, p. 125–134. fig., table. Durand, E., **C. Rocket sonde research at the Naval Research Laboratory.** *Ibid.*, p. 134–148. 9 figs. **DLC**—In Pt. A the author gives a general description of a V-2 rocket, of its trajectory and of its telemetering apparatus. He then discusses the energy distribution in the ultraviolet solar spectrum and its relation to problems of the earth's atmosphere on the basis of observational data obtained by means of rocket flights. Other types of astrophysical data, that can be secured by means of rocket experiments, are listed. In Pt. B the construction of a rocket spectrograph capable of covering the region of the spectrum down to Lyman α and giving a high resolving power is described. A preliminary analysis of the intensities of the spectra obtained with this spectrograph is presented. Direct proof of the transparency of the earth's atmosphere above the ozone layer to 2200Å is provided. In Pt. C the author discusses the research and development work in the fields of atmospheric physics, astrophysics and the ionosphere that are being conducted at the Naval Research Laboratory. Methods for the study of pressure and temperature of the upper atmosphere are presented. The design and use of a vacuum grating spectrograph to photograph the sun's rays are described. And there is presented a method for determining the index of refraction of the atmosphere as a function of altitude by observing the difference in the velocity of propagation of two signals. (*Same item as* 11–19, Nov. 1950, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere research 2. Rockets 3. Ultraviolet light. I. Clearman, H. E. II. Durand, E.**—*I.L.D.*

11I–4 551.510.53:551.596.1

Regula, Herbert, **Erforschung der Hochstratosphäre durch Schallwellen.** [Investigation of the high stratosphere by sound waves.] *Meteorologische Rundschau*, 2(9–10):263–267, Sept.–Oct. **1949.** 5 figs. **DWB**—Zones of silence and abnormal audibility of explosions point to a strong inversion at 35 to 40 km. This is confirmed by V-2 ascents. The location of zones of audibility exceeding 150 km, mainly to west in summer and east in winter, agrees with summer and winter winds according to SCHERHAG (1948) from topography of 41 mb surface (ca. 22 km), which are therefore considered to represent whole layer 20–45 km. Further experiments should bring temperatures and winds up to 45 km into discussion of synoptic problems. (*Same item as* 4–40, April 1950, *Met. Abstr.*) *Subject Headings:* **1. Stratospheric structure 2. Acoustical phenomena 3. Audibility zones.**—*C.E.P.B.*

1950

11I–5 551.507.362.1

†Franklin Institute. Laboratories for Research and Development, Phila., **Development, design, instrumentation. Blossom 4 series.** Contract AF 19(122)-33, Final Report F-2106, March 1, 1950. 2 vol. (401 p.) numerous figs. (some fold., also many photos, some in color), refs. (Vol. 2, p. 306–308), bibliog. (Vol. 2, p. 401). **DWB**—The details of history, organization, design, development, instrumentation and launching of the V-2 rockets at White Sands (Blossom I, II-A, II-B, and III and Aspect I, II, and III from Feb. 29, 1947 to June 11, 1949 in Missiles No. 20, 28, 37 and 39) are treated in Vol. 1, along with complete information about the development of the V-2 and other rockets in Germany from 1932–1942. The second volume deals with the design, development and instrumentation of the Blossom IV series. Blossom IV-A was carried by V-2 rocket No. 41 fired on March 21, 1949. Radiation, electrical, pressure, temperature, ionospheric and other data were obtained by parachute, radar, radio and optical methods. Blossom IV-B was fired June 14, 1949. (*Same item as* 8.1–135, Jan. 1957, *Met. Abstr.*) *Subject Headings:* **1. Rocket research 2. Rocket instrumentation 3. V-2 rocket flights 4. White Sands, N. Mex. I. Allen, Henry B.**—*M.R.*

11I–6 551.510.53:551.524.7

Michigan. University. Engineering Research Institute, **Pressure and temperature measurements in the upper atmosphere.** Contract W-33-038-ac-14050, Final Report, May 11, 1950. 16 p. photos, graphs. **DWB**—A condensed summary of results of 6 V-2 rocket flights in which the Univ. of Michigan participated (between Aug. 22, 1946 and June 10, 1949). Eleven reports on work are listed and contents of each summarized. It was concluded that the ionization gage offered the best possibilities for measuring density at high altitudes. Either the thermionic or the radioactive type will give good results. Refinements have been made during the period of use. Detailed photographs and drawings of equipment are presented. Temperature profile (30–110 km) obtained by rocket flight No. 28 (Dec. 1947) is compared with NACA standard atmosphere model and with NRL #21 (1947). *Subject Headings:* **1. Upper atmosphere 2. Ionization gages 3. V-2 rocket flights 4. Standard atmosphere 5. Temperature profiles. I. Spencer, N. W.**—*M.R.*

11I–7 551.510.53:551.507.362.1

†Michigan. University. Engineering Research Institute, **Atmospheric phenomena at high altitudes.** Contract W-36-039 sc-32307, Project DA 3-99-07-022. Final Progress Report for the period July 15, 1946 to Aug. 31, 1950. 162 p. 157 figs., 38 refs. **DWB**—Upper air measurements carried on by the Institute in conjunction with V-2 and Aerobee firings at White Sands Proving Grounds are reported. The program included investigation of air composition, temperature, pressure and wind direction and velocity between altitudes of 30 and 80 km. Technical details of the instruments developed and of their installation and operation are given in numerous photos and technical drawings. Data obtained are presented in tables and graphs, instruments developed for their evaluation described and illustrated, calculations and methods used in computing results explained. The complete report comprises every phase of the program. Earlier reports are partially included. *Subject Headings:* **1. Upper atmosphere research 2. Rocket soundings 3. Rocket instrumentation. I. Jones, L. M. II. Neill, Howard W.**—*G.T.*

11I–8 551.524.7(789)

*Nazarek, Alex, **The temperature distribution of the upper atmosphere over New Mexico.** *American Meteorological Society, Bulletin*, 31(2):44–50, Feb. 1950. 3 figs., 2 tables, 11 refs., 3 eqs. Abstract p. 44. **DWB**—Mean temperatures in the region from 15 km. to 129 km. computed by applying the hydrostatic equation to pressure data obtained from V-2 rocket soundings over New Mexico. Results compare roughly with other recent vertical-temperature gradient models, except in the area around 100 km. where a marked irregularity appears in the lapse rate, probably due to a transition layer of dissociation of molecular into atomic oxygen. Detailed results given in tabular and graphic form. (*Same item as* 4–83, April, 1950, *Met. Abstr.*) *Subject Headings:* **1. Upper air temperatures 2. Rocket data 3. New Mexico.**—*M.R.*

11I–9 551.507.362.1:551.506.7

†Newell, Homer E., Jr., **A review of upper atmosphere research from rockets.** *American Geophysical Union, Transactions*, 31(1):25–34, Feb. 1950. 6 figs., 34 refs. Abstract p. 25. **DWB**—Research on the upper atmosphere with the V-2 and Aerobee rockets is reviewed; including progress in control of flight, tracking and recovery of instruments and data, and future research program of Naval Research Laboratory working together with the Signal Corps, Air Force and Applied Physics Laboratory. Relation of altitude to pressure and temperature up to 120 km. as determined from flights in New Mexico, shown graphically. Solar spectrum, ozone concentration, cosmic radiation, ionospheric and photographic data on cloud formations, are discussed and illustrated. (*Same item as* 4–14, April 1950, *Met. Abstr.*) *Subject Headings:* **1. Rockets 2. Upper atmosphere research.**—*M.R.*

11I–10 551.521.13:551.508.21:551.507.362.1

Rhode Island. State College. Upper Atmosphere Research Laboratory, **Insolation of the atmosphere.** Reports, Nos. 2, 4, 6–10, Jan. 30, July 31, 1949–June 30, **1950.** 7 pieces. diagrs., graphs, photos., eqs., refs., bibliog. in Report No. 10. **DWB**—The details of each phase of this project, which extended over a period of 3 years, are contained in the first 9 Reports, and are summarized in some detail in the Final Report (No. 10). The purpose of the work was to develop accurate instruments for installation in the Aerobee rocket, and to install and test these instruments in actual rocket flights to great heights in order to determine more accurately the value of the solar constant. The present Smithsonian value of the solar constant (1.94 ly/min), the "standard" constant (1.88) and their determination are examined and criticized. A pyrheliometer was developed which made use of thermistors as sensing elements. Details of construction, wiring, installation in rockets and calibration are given in appendixes. Two actual flights were made at Holloman AFB, New Mexico on March 14 and May 26, 1950. The first flight was a failure, but the second reached 40.7 miles and gave values of 1.34 to 2.12 ly/min, with a large number centering around the average of 1.97. Good bibliographies on pyrheliometry, the work of the Smithsonian Institution, thermistor, bolometers, etc., their construction, testing and use, are contained in several of these reports. Excellent photographs and diagrams show mechanical and electrical construction of equipment. (*Same item as* 6.1–165, Jan. 1955, *Met. Abstr.*) *Subject Headings:* **1. Solar constant 2. Rocket flights 3. Pyrheliometers 4. Thermistors. I. Albricht, John G. II. Quirk, Arthur L. III. Smithsonian Institution.**—*M.R.*

11I–11 551.507.362.1:551.510.53

Van Allen, James A. (*Appl. Physics Lab., Silver Spring, Md.*), **Use of rockets in upper atmosphere research.** *I.U.G.G. Association of Terrestrial Magnetism and Electricity, IATME Bulletin*, No. 13:531–536, **1950. DWB**—The first successful flight with instruments to heights >37 km were made with captured V-2 rockets. Beginning with April 16, 1946 (the first one was a failure) up to July 1, 1948, 31 V-2's were fired (with upper air research equipment attached) and 21 flights were successful. Highest flight was 184 km; average 135 km (a WAC Corporal was fired in Oct. 1945 with a maximum altitude of 72 km, but with only a 10 kg payload). A summary of results to date, the use of the aerobee, practical aspects of rocket research, the institution cooperating in the program, and the rocket technique in upper atmosphere research are outlined in this report. (*Same item as* 5.4–4, April 1954, *Met. Abstr.*) *Subject Headings:* **1. Rocket research 2. Upper atmosphere research.** —*M.R.*

1951

11I–12 551.506.324.1:551.507.362.2.1:778.3(789)

Bjerknes, Jakob, **Detailed analysis of synoptic weather as observed from photographs taken on two rocket flights over White Sands, New Mexico, July 26, 1948.** *Rand Corporation, Santa Monica, Calif.* (*Publication*), P-887, April **1951.** 17 p. 4 figs. **DWB** (M(055) R186p)—Rocket photographs; a surface synoptic chart of the U. S.; upper air wind maps for 8000, 14,000 and 30,000 ft and 300 mb contours and a profile to 32,000 ft along 32°N illustrate the synoptic and cloud patterns on July 26, 1948 at the time when the composite picture from a V-2 (No. 40) showed a strip of flat As and Ac clouds extending from the Rio Grande to Flagstaff, Ariz. as the remnant of a trailing cold front. A parallel strip of Ci clouds is seen to lie 100 miles or so south of the As, Ac band, or along the Mexican border of Arizona and New Mexico. *Subject Headings:* **1. Synoptic study of cloud system on rocket photographs 2. Rocket cloud photograph analysis 3. White Sands, N. Mex.** —*M.R.*

11I–13 551.507.362.1:551.521.67

Carpenter, R. O'B., **Solar X-radiation.** Bairds Associates, Inc., Contract W19-122-ac-23, Final Technical Report, No. 1, May 15, 1948 to June 30, **1951.** 97 p. figs., tables. **DWB**—An elaborate summary of the work done during 3 years of investigation of methods for measuring the soft X-radiations from the sun. Theory of sun's corona radiation and transmission through the atmosphere and through various filter materials, techniques of photography and shielding of visible radiation (>3000 Å) by thin beryllium and aluminum metal foils, problem of evaporating and the "Pinhole Problem," design and manufacture of film packets for use in V-2 rocket ascents, design of shutters, analysis of data obtained on rocket ascents, causes of failure, actual data and unfinished work are discussed and amply illustrated. Ten V-2 flights were attempted, involving exposure of 82 packets, 25 of which were recovered and only 3 satisfactory exposures obtained during the period from Dec. 1947–March 1951. It is concluded that foil filters are not satisfactory for determining distribution of solar energy at specific wave lengths in the X-ray bands. Crystal grating spectrometers are suggested as more practicable. A scintillation counter appears to be more satisfactory than a photographic film, and the NRL has experimented with Geiger counters for measuring solar X-rays. Need is for a crystal spectrometer. Only two laboratories to study X-rays are in operation

in the U. S. (at Ohio State and at Washington State). Maximum expected intensity of X-radiation is at 29 Å. Percentage and actual transmission of radiation below this, and below 15, 10 and 5 Å is tabulated. Transmission of *Be*, *Al*, and *Cr* 2μ thick, and of *Al* foil of various thicknesses shown on graph for 0–30 Å. Transmission tests were made at Univ. of Oregon. Relative absorption for $\lambda = 1$–10 Å and 10–100 mi height given. (*Same item as* 6.6–213, June 1955, *Met. Abstr.*) *Subject Headings:* **1. Solar X-radiation 2. X-ray photography 3. V-2 rockets.**—*M.R.*

11I–14 551.510.53:551.507.362.1

Kalinovskiĭ, Aleksandr Boleslavovich and Pinus, N. Z., **Aerologiia; metody aerologicheskikh nabliudeniĭ.** [Aerology; methods of aerological observations.] Leningrad, Gidrometeoizdat., **1951.** Ch. 12, **Primenenie raket dlia issledovaniia atmosfery.** [Use of rockets for investigating the atmosphere.] p. 400–409. 6 figs., 2 tables, 14 refs. (p. 428). **DLC** (QC 879.K3)—The early history of rocketry and principles of rocket propulsion are briefly outlined. The first Soviet meteorological rocket, a cigar-shaped vehicle, was designed by M. K. Tikhonravov. It was launched successfully in 1933 and reached 10,000 m, a record altitude at that time. The general appearance of the rocket is shown. Construction diagrams of the German V-2 and the American Wac-Corporal rockets are presented and their technical characteristics are listed in a comparative table. Conditions under which instruments carried by rockets have to operate are described and techniques of solar spectrography, cosmic radiation measurement, air sampling, pressure and temperature determination by means of rocket-borne instruments are discussed in some detail. Schematic diagrams of a vacuum and a gas manometer are presented. A table showing atmospheric temperature, pressure, molecular density and mean free path at various altitudes up to 100 km is also included. (For abstract on the whole book, *see* 6.7–10, July 1955, *Met. Abstr.*) *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Rocket instrumentation 3. Soviet rockets.**—*G.T.*

11I–15 551.510.5:551.507.362.1

Ley, Willy, **Upper atmosphere, its exploration and exploitation.** *Aeronautical Engineering Review*, 10(2):20–24, 30, Feb. **1951.** photos, diagrs. graphs, table. **DLC**—Flight paths of various types of rockets, including one to an approximate antipodal point with a maximum height of over 155 mi, are described and analyzed in tables and diagrams. The author concludes that the region between about 11 mi and 25 mi, too high for "air-breathing" engines and too low for rockets, seems to elude exploration. Photographs and drawings of rockets and a table showing pressure recordings made by two different rockets up to an altitude of 66,930 ft are presented. (*Same item as* 3.6–68, June 1952, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere research 2. Rocket intrumentation.**—*G.T.*

11I–16 551.510.41:551.510.53:551.507.362.1

Michigan. University. Dept. of Aeronautical Engineering, **Atmospheric phenomena at high altitudes.** Contract DA 36-039-sc-125, Progress Report No. 5, Final Report, Sept. 1, 1950 to Dec. 31, **1951.** 43 p. 36 figs., 4 tables, 11 refs. **DWB**—List of a series of reports dealing with activities of project to determine pressure, temperature, density and composition of air at 100 km during aerobee ascents. The report describes methods of obtaining and analyzing samples, shock wave experiments for temperature, a falling sphere experiment for ambient density and temperature. Many photos and graphs show activities and results of project, as well as instrumentation equipment. (*Same item as* 5.6–89, June 1954, *Met. Abstr.*) *Subject Headings:* **1. Atmospheric composition 2. Aerobee observations 3. Stratospheric structure. I. Jones, Z. M.**—*M.R.*

11I–17 551.521.12:551.507.362.1

Rhode Island. University. Upper Atmosphere Research Laboratory. **Insolation of the atmosphere.** Contract AF 19(122)-249, Progress Reports, Nos. 1–5, June 25/Sept. 25, **1950** to June 25/Sept. 25, **1951.** 5 pieces. figs., tables refs., eqs. **DWB**—Description of the development, design, construction and testing of equipment, for measurement of the intensity of solar radiation at high altitudes, installed in a biaxially controlled Aerobee rocket. For this purpose semiconductor (thermistor) bolometers and narrow band-pass amplifiers were improved. The instrument was calibrated with the Eppley tubular pyrheliometer (standard U. S. Weather Bureau instrument). Report No. 5 deals with the use of the equipment on balloon flights. Temperature data are given for the instrument block and the internal section of the gondola obtained from a balloon test flight. (*Same item as* 6.1–166, Jan. 1955, *Met. Abstr.*) *Subject Headings:* **1. Solar radiation measurement 2. Rocket research 3. Upper atmosphere research. I. Quirk, Arthur L.**—*A.A.*

1952

11I–18 551.510.535

*Beth, Eric W. (*AF Cambridge Res. Center*), **Altitude dependence of some upper atmosphere properties.** *U. S. Air Force, Cambridge Research Center, Geophysical Papers*, No. 11:255–262, **1952.**

5 figs., 7 refs. **DWB**—Rocket research results of some investigators are reported for equivalent electron density at heights up to 143 km, ion density around 100 km, and for pressure, kinetic temperature and density of the air between 40 and 100 km. The last three quantities are shown in approximate graphs. The investigation of ion density is still in its initial stage. The equivalent electron density was measured during a magnetic storm; between 110 and 139 km the altitude dependence of electron density was unimportant, its average value being about $1.3 \pm 0.2 \times 10^5$ electrons/cm^3. Below 95 km the concentration was too small to be detected. Between 95 and 110 km the ionized region was found to have a patchy or "spongy" structure. (*Same item as* 4.11–98, Nov. 1953, *Met. Abstr.*) *Subject Headings:* **1. Ionospheric composition 2. Electron density 3. Ion density 4. Air density 5. Rocket research.**—*Author's abstract.*

11I–19 551.507.362

Burgess, E., **High-altitude research.** *The Engineer*, London, 194(5042, 5043):338–340; 370–373, Sept. 12; 19, **1952.** 8+18 figs. **DLC.** Transl. of this article into Russian: **Issledovanie verkhnikh sloev atmosfery.** *Voprosy Raketnoĭ Tekhniki*, Moscow, 2(14):122–131, **1953.** 9 figs. **DLC**—A very informative technical article on the development and use of various types of rockets for meteorological and cosmic ray research of the atmosphere to 120–135 mi. The work began in 1946 with the flights of the captured V-2 rockets in New Mexico. Later developments were the "Viking," the WAC corporal, the Aerobee and, finally, a combination of the WAC corporal and the V-2 which reached 250 mi in 2-step firing methods of increasing stability control, payload, recovery of data, telemetering systems and air-borne calibration units. Effects of high speed, limiting time allowed for exposure in solar or terrestrial photography, and of requiring a sampling rate of 300 times a second are described. It also requires high accuracy in timing and perfect functioning of all equipment under rigid conditions unknown in laboratory or other soundings. Both electronic and mechanical timers are used in the rocket and on the ground (radar and control equipment) to insure perfect timing. Excellent illustrations show the mechanical details and schematic diagrams show the location of instruments in several types of rockets. (*Same item as* 5.4–1, April 1954, *Met. Abstr.*) *Subject Headings:* **1. Rocket instrumentation 2. Rocket development.**—*M.R.*

11I–20 551.510.53

Burnight, T. R. (*Naval Res. Lab., Wash., D. C.*), **Physical characteristics of the upper atmosphere.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 11: 67–69, **1952. DWB**—Recent observations by rockets reveal that at 160 km pressures were about 10^{-6} mb and temperatures between 80 and 160 km about 250°K. Solar spectrum (69–115 km) reached 2000 Å, so that solar radiation for 200, 2000 and 3000 Å approximates 4500°K (or possibly as low as 3800°K) black body. Measurements of X-radiations (10 Å) and solar radiation more than 1350 Å (near 100 km) and O_3 concentration to 70 km have been obtained. (*Same item as* 4.11–87, Nov. 1953, *Met. Abstr.*) *Subject Headings:* **1. Solar spectrum 2. Rocket observations 3. Upper atmosphere physics.**—*M.R.*

11I–21 551.521.63:551.507.362.1

Colorado Univ. Upper Air Laboratory, **Instrumentation phase of extreme ultraviolet research.** Contract W19-122-ac-9, The Zodiacal Light Eclipse Project, Final Report, May 31, **1952.** 22 p. 16 figs. **DWB**—The optics group of the Upper Air Laboratory has participated in the following activities: instrumentation; far ultraviolet radiation studies; testing of rocket flight equipment; fundamental experimental work pertaining to problems encountered in the upper atmosphere; and basic theoretical investigations suggested by the experimental aspects of the Group's activities. Instrumentation work has centered around the ultraviolet vacuum test chamber. The chamber, volume 450 liters, contains a grazing-incidence grating optical system. Three types of ultraviolet sources for the test chamber have been successfully designed and constructed. An ultraviolet monochromator was designed, tested and constructed during the years 1949 and 1950. A small grazing-incidence, concave grating spectrograph was constructed and also flown in the rocket fired April 12, 1951. A photoelectric photometer capable of detecting individual spectrum lines in the far ultraviolet has been designed, constructed and tested. Experimental research undertaken by the Optics Group has centered around the instrumentation and use of the vacuum test chamber although several other types of problems have been investigated. (*Same item as* 5.7–98, July 1954, *Met. Abstr.*) *Subject Headings:* **1. Ultraviolet radiation research 2. Rocket instrumentation.**—*Author's abstract.*

11I–22 551.521.18:551.507.362.1

Denver. University. Department of Physics, **Daylight luminescence and infrared absorption.** Contract W19-122-ac-16, Final Report [**1952**]. 34 p. table, 21 plates, refs., additional publications, p. 33–34. **DWB**—A summary of 16 reports (from July 1, 1948 through April 30, 1952) with brief notes on the period from April 30 through May 31, 1952. Daylight luminescence was measured

with spectrographic equipment carried by balloons to 53,000 and about 100,000 ft, respectively. Elaborate spectrometers and photographic equipment for recording infrared absorption from V-2 rockets have been developed and tested in the laboratory on Mount Evans, Colo. (el. 14,150 ft), by means of balloon ascents and spectrographs, to show absorption between 4.3 to 0.4μ. The details of the heliostat, the transmission grating spectrograph and concave mirror-prism spectrographs are described and illustrated, as well as the ground equipment, mountain installations, testing devices, calibration charts and actual records. Features of the equipment are presented in photographs. Observational data on: 1) atmospheric water vapor determination by means of infrared spectroscopy, 2) spectro-solar intensity in the infrared, 3) color temperature of the sun and 4) solar energy at earth's surface are presented in diagram and discussed. F. E. Fowle's method of determination of precipitable water from infrared spectrum is verified in general and its reliability discussed. (*Same item as* 6.4-174, April 1955, *Met. Abstr.*) *Subject Headings:* **1. Daylight luminescence 2. Infrared absorption 3. Precipitable water vapor 4. Rocket instrumentation.**—*W.N.*

11I–23 551.510.53(789)

Harvard College Observatory. Rocket Panel, **Pressures, densities, and temperatures in the upper atmosphere.** *Physical Review*, 88(5):1027–1032, Dec. 1, **1952.** 3 figs., 3 tables. **DWB**—Smoothed curves of pressure, density and temperature from 0 to 220 km from results of 68 V-2, 63 Aerobee and 7 Martin Viking rocket ascents at White Sands, N. Mexico. The panel does not consider this a standard atmosphere, but merely the combined results of numerous investigations as of Jan. 1952. Temperature calculations by many groups are tabulated and the weighted means and adopted values shown. Below 30 km values are obtained from radiosonde ascents at White Sands. No correlation has been made for dissociation of $O_2 > 80$ km, nor for seasonal effects, daylight effects or instrumental errors (the latter may be greater than real variations). Other soundings with rockets (on the equator) or by meteors and acoustical means in the Arctic (Fairbanks) and tropics are related to these data. The whole matter is still pending. (*Same item as* 5.3–121, March 1954, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere structure 2. Upper atmosphere models 3. Rocket data 4. White Sands, N. Mex.**—*M.R.*

11I–24 551.510:551.507.362.1(789)

Havens, R. J., Koll, R. T. and LaGow, H. E. (*U. S. Naval Res. Lab., Wash., D. C.*), **The pressure, density, and temperature of the earth's atmosphere to 160 kilometers.** *Journal of Geophysical Research*, 57(1):59–72, March **1952.** 7 figs., 4 tables, 13 refs. Also [table extracted from this article]: **Druck, Dichte und Temperatur der Erdatmosphäre bis zu 160 km Höhe.** [Pressure, density and temperature of the earth's atmosphere up to 160 km altitude.] *Sternenwelt*, Munich, 4(9/10):186, **1952. DLC.** Also [presented values extracted from this article], Grandmontagne, R., **Remarques sur le calcul des températures de l'atmosphère,** [Notes on the calculation of atmospheric temperature.] *Annales de Géophysique*, 8(4):443–446, Oct./Dec. **1952.** 2 figs., 3 tables, 2 refs. **DWB**—A program of pressure measurements with rockets over White Sands, N. Mex., and over the equator has given values for atmospheric pressure, density, and temperature from the ground up to 160 km above sea level. The data have been obtained from about a dozen rocket flights at White Sands, N. Mex., lat. 32°N, long 106°W, and from one flight at the equator, long. 160°W. Measurements were made in every month except April, June and July. One rocket was flown at midnight, while the others were between 09^h00^m and 19^h00^m local time. Except for one daytime flight at White Sands, all the pressure data agree within the experimental errors. The fundamental data are pressures measured on the nose tips, nose cones, and tail section of V-2, Viking, and Aerobee rockets. From these measurements, atmospheric pressures, densities, and temperatures have been deduced. The pressure at 160 km is 2×10^{-6} mm Hg, and the density is 1.5×10^{-9} gm/m^3. The temperature reaches a maximum of 270°K at 50 km, a minimum of 190°K at 80 km, and increases to about 500°K at 160 km. (*Same item as* 4.1–75, Jan. 1953, 5.2-31, Feb. 1954 and 5.9 92, Sept. 1954, *Met. Abstr.*) *Subject Headings:* **1. Atmospheric structure 2. Stratospheric structure 3. Rocket soundings 4. White Sands, N. Mex.**—*Authors' abstract.*

11I–25 551.521.17

†Mandel'shtam, S. L., **Obzor rabot po issledovaniiu korotkovolnovoĭ ul'trafioletovoĭ radiatsii solntsa.** [Outline of investigations of short wave UV solar radiation.] *Uspekhi Fizicheskikh Nauk*, Moscow, 46(2):145–178, Feb. **1952.** 19 figs., 4 tables, 31 refs. **DLC**—A review of results of investigations carried out during recent years in the U. S. by means of rocket-borne optical equipment (V2 ascents), attaining a height of 150 km. After pointing out the paramount importance of investigating short wave ultraviolet radiation for the knowledge of the physics of the earth and the sun the author evaluates and discusses the results achieved in two groups of investigations. The first investigates the sun's spectrum with aid of spectrographs in the region between 3000 and 2000 A, while the second measured the radiation flux in the section between 2000 and 0A without spectral differentiation by separating out narrow spectral intervals. (*Same item as* 4.11–137, Nov. 1953, *Met. Abstr.*) *Subject Headings:* **1. Ultraviolet radiation 2. V-2 rockets.**—*A.M.P.*

11I-26 551.510.53(02)

Mitra, Sisir Kumar (*Prof. Physics, Calcutta Univ.*), **The upper atmosphere.** 2d ed. Calcutta, The Asiatic Society, **1952.** p. 559–578, 13 figs. **DLC** (QC879.M49 1952)—Ch. XII, Rocket exploration of the upper atmosphere is a nicely illustrated section of the book. After the introduction, the characteristic features of V-2 and the Aerobee rockets are described. This is followed by information referring to the instrumentation and data recovery. In the second half of the chapter we find the measurements carried out and the results obtained by aid of rockets. The observation covered various fields: ultraviolet, solar spectrum, pressure, temperature, ionosphere, composition of upper atmosphere, aerial photography, magnetic field, etc. (For abstract on the whole book, *see* 11B–100, Feb. 1960, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere physics textbooks 2. Atmospheric physics 3. Rocket exploration of the upper atmosphere. I. Rozenberg, G. V.** (*transl.*) **II. Makarov, E. A.** (*transl.*).—*E.K.*

11I-27 551.510.53:551.507.362.1:551.596.1

†Temple Univ. Research Institute, **Research in the physical properties of the upper atmosphere with V-2 rockets.** Contract W19-122-ac-12, Final Report, April 1, 1948 to Feb. 29, 1952. Aug. 20, **1952.** 101 p. 31 figs., eqs., 148 refs. on humidity measurements, p. 31–39; 26 general refs., p. 98–99; 43 refs. on acoustics, p. 99–101. **DWB**—This report covers work completed during the past four years. In particular it includes work on ion clusters, statistical fluctuation of density at a given point in a gas, and the fall of a warhead with a parachute from high altitude. These are theoretical considerations and the original reports should be read for details (*see, for example,* 2.9–22, 4.6–253, 5.3–326 and 6.5–356, 6.8–93, *Met. Abstr.*), since only the results can be given here. It also includes work on the measurement of absorption coefficients of air at low pressures and at various frequencies. This gives results that fall below the classical at low pressures and are believed to be due to the effective viscosity coefficient. Experimental curves and theoretical considerations are given. Sample calibration curves for microphones and of the anechoic chamber are included as well as photographs and descriptions of various pieces of apparatus such as wind tunnel, ultrasonic wave analyzer, pulser, apparatus installed in Blossom IV–G, automatic feed wire exploder, etc. Results on measurements of noise on the skin of the missile and on meteoritic impacts on the nose obtained during the V-2 flights are given.—Various sources of rather intense sound were investigated as to their suitability for high altitude work, including spark gaps, explosives (primers) and exploding wires.—Transient responses of microphones and velocity of sound in tubes and at various pressures were investigated. (*Same item as* 5.3–123, March 1954, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere research 2. Rocket instrumentation 3. Acoustical soundings. I. Bohn, J. Lloyd II. Nadig, Francis H.**—*Author's abstract.*

11I-28 551.510.534:551.507.362.1

Van Allen, J. A. and Hopfield, J. J. (*Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.*), **Preliminary report on atmospheric ozone measurements from rockets.** *Société Royale des Sciences de Liège, Mémoires, Ser. 4,* 12(1/2):179–183, **1952.** fig. **DLC**—Rocket (aerobee) borne ozone spectrometer is illustrated diagrammatically and results of flight on Jan. 25, 1951 at White Sands, N. Mex., using a quartz spectrograph, shown for 5 km height intervals from 25 to 60 km (0.061 cm at 25 and 0.000054 cm at 60 km). (*Same item as* 5.11–65, Nov. 1954, *Met. Abstr.*) *Subject Headings:* **1. Ozone distribution in upper atmosphere 2. Rocket instrumentation 3. Quartz spectrographs.**—*M.R.*

11I-29 551.510.53:551.507.362.1:551.590.25

Whipple, Fred L. (*Harvard College Obs., Cambridge, Mass.*), **Results of rocket and meteor research.** *American Meteorological Society, Bulletin,* 33(1):13–25, Jan. **1952.** 5 figs., 3 append. **DWB**—In this review of recent rocket sounding and photographic observation of meteors, unpublished data on pressure, density and temperature in the upper atmosphere, on composition of the upper atmosphere, on radiation (solar constant, solar ultraviolet and solar X-rays), on ionization and magnetic effects and on possible effects of meteors and micro-meteorites are presented and discussed. Data are classified into 3 "weight classes" according to their considered reliability. Pressure, temperature and density curves are constructed up to an altitude of 130 km. (*Same item as* 4.4–88, April 1953, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere research 2. Rocket soundings 3. Meteor research 4. Upper air data 5. Ionization 6. Magnetic effects.**—*G.T.*

1953

11I-30 551.507.362.1:551.510.53

Dow, W. G. and Spencer, N. W., **Measurement of ambient pressure and temperature of the upper atmosphere.** Michigan. Univ. Engineering Research Institute, Contract AF 19(122)-55, Final Report, Aug. **1953.** 76 p. 30 figs., table, foot-refs.—The general objective of the work under subject contract is to obtain measurements of the ambient pressure and temperature of the upper

atmosphere using high-altitude rockets as research vehicles. A new method which permits an essentially point-by-point determination of ambient temperature from measured pressure values has been developed and utilized experimentally. Resulting upper-atmosphere data are presented. The equipment necessary to implement the theoretical method has been developed. The alphatron ionization gage constitutes the basic pressure-sensitive device, and provides the basis for a pressure measurement system that will measure gas pressures in the range 760 mm Hg to 10^{-3} mm Hg. Associated equipment utilizing a gyroscope to allow determination of missile angle of attack, and many accessory pieces of equipment, less spectacular but necessary to the experiment, have been developed. This report reviews that portion of the research which was conducted under subject contract. (*Same item as* 5.10–50, Oct. 1954, *Met. Abstr.*) *Subject Headings:* **1. Rocket measurements 2. Pressure measurements in stratosphere 4. Upper air temperature data.**—*Authors' abstract.*

11I–31 551.507.362.1:551.524.7:551.510.534(789)

Johnson, Francis S. (*U. S. Naval Research Lab., Wash., D. C.*), **High-altitude diurnal temperature changes due to ozone absorption.** *American Meteorological Society, Bulletin*, 34(3):106–110, March **1953.** 5 figs., 114 refs. **DWB**—The heating effect due to absorption of solar energy by atmospheric ozone was calculated from direct measurements of ozone concentrations and of the ultraviolet spectral intensity of sunlight made during a rocket flight over New Mexico on June 14, 1949. Assuming a constant rate of heat loss throughout the day and night due to infrared emission, and no temperature change from day to day, the diurnal temperature change was found to have maximum value of 5.3°C at 48 km, falling to 10° at 31 km and 70 km. (*Same item as* 4.11–164, Nov. 1953, *Met. Abstr.*) *Subject Headings:* **1. Stratospheric temperatures 2. Ozone absorption 3. Rocket data 4. New Mexico.**—*Author's abstract.*

11I–32 551.510.535:551.507.362.1(02):016

†Newell, Homer E., Jr. (*Naval Research Lab., Wash., D. C.*), **High altitude rocket research.** N. Y., Academic Press, **1953.** 298 p. 93 figs., 37 tables, numerous refs. at end of each chap. Price: $7.50. **DLC**—A thoroughly readable but technical book. The first chapter discusses the upper atmosphere in general, the use of various types of rockets in present day investigations, and a tabulation of rocket flights made from March 1946 to Dec. 1952 and the essential facts about these flights. Ch. II takes up the rocket itself as a research tool (performance, pay load, motions, heating, and a schedule of preparations for firing). Ch. III gives results of experience in recovery of data (both by telemetering or usual means and from recovery instruments, records or photographs). Ch. IV gives theory and practice of determining pressure, density and temperature in the upper atmosphere and the latest data (either measured or derived) and models obtained therefrom. Ch. V gives a brief account of sound grenade or rocket measurements of winds at great altitudes. Ch. VI is a summary or description of equipment, methods and data on solar radiation obtained by rocket spectrographs. Ch. VII takes up spectrographic and photoelectric determinations of ozone and the effects of ozone on the atmospheric and solar radiation. Dissociation and diffusive separation of O_3 are important aspects discussed. Ch. VIII is on the ionosphere and the earth's magnetic field; Ch. IX on cosmic rays and their measurement, intensity, distribution with height and latitude, etc. The final chapter gives a summary of methods and results of high altitude photography from rockets. Accuracy of equipment and methods used and possible sources of error are emphasized throughout the book. Only published results and data have been used. Subject and author indexes add to the usefulness of the book. (*Same item as* 5.5–7, May 1954, *Met. Abstr.*) *Subject Headings:* **1. Rocket research 2. Upper atmosphere research textbooks 3. Rocket bibliographies.**—*M.R.*

11I–33 551.507.362.1(789)

†Newell, Homer E., Jr. and Siry, Joseph W., **Rocket upper air research.** *U. S. Naval Research Laboratory, NRL Reprint*, No. 12–53, **1953.** 10 figs., table, 34 refs. From: *American Rocket Society, New York, Journal*, p. 7–13, Jan./Feb. **1953. DWB**—Review of progress and results of rocket soundings, especially those conducted at White Sands, N. Mex. Various methods of interpreting the available data are discussed. Graphs (reprinted from various papers) showing measured and calculated values of atmospheric pressure, density, temperature, cosmic ray distribution, ozone concentration, electron density, and intensity of the earth's magnetic field are presented for various altitudes (up to 220 km). A wind of 80 m/sec was measured at 200 km. The currently accepted value of 0.131 watt/cm² for the solar constant has been shown by a rocket measurement to be 5% too low. (*Same item as* 5.6–51, June 1954, *Met. Abstr.*) *Subject Headings:* **1. Rocket research 2. Atmospheric structure 3. White Sands, N. Mex.**—*G.T.*

11I–34 551.507.362.1

Singer, S. F., **Synoptic rocket observations of the upper atmosphere.** *Nature*, 171(4364):1108–1109, June 20, 1953. 15 refs. **DWB**—Outlines a proposal for launching small rockets from aircraft

to obtain great heights cheaply. Possibilities include synoptic ozone and UV measurements, high altitude cloud surveys, and cosmic radiation observations. (*Same item as* 4.11–52, Nov. 1953, *Met. Abstr.*) *Subject Heading:* **1. Rocket research.**—*C.E.P.B.*

11I–35 551.508.25:551.507.362.1

Slavin, Robert M., **Rocket-borne equipment for the measurement of infrared radiation.** *U. S. Air Force. Cambridge Research Center, Instrumentation for Geophysical Research*, No. 2, Feb. **1953**; *AFCRC Technical Report*, 53-2. 19 p. 15 figs. (incl. photos), ref. **DWB**—The rocket-borne equipment described was designed to measure sky-background radiation in the region around 8000 Å and in the range from 3×10^{-12} to 3×10^{-7} watts/cm²/sq deg. The CE25V-A/B phototube used as the sensing element is magnetically modulated to provide a 120-cps signal to the three-stage amplifier. Rectifier-cathode-follower output circuits provide voltages for telemetering to ground stations during rocket flight. (*Same item as* 7.1–152, Jan. 1956, *Met. Abstr.*) *Subject Headings:* **1. Rocket-borne instruments 2. Radiation instruments 3. Infrared radiation measurement.**—*Author's abstract.*

11I–36 551.507.362.1:535.33

Tousey, R. (*Naval Res. Lab., Wash., D. C.*), **Rocket spectroscopy.** *Optical Society of America, Journal*, 43(4):245–251, April **1953.** 15 figs., refs. **DWB**—The results of studies of the solar spectrum made from rockets and extending from the ultraviolet to soft X-rays are reviewed. Experiments with spectrographs have given the solar intensity distribution to 2000 Å, the Fraunhofer spectrum to 2300 Å with varying resolution reaching 0.6 Å above 2630 Å, and the magnesium doublet at 2800 Å with intense emission cores. The vertical distribution of ozone was determined to 70 km and found to be in agreement with a photochemical calculation. Diurnal heating in the ozone layer was calculated. The intensity of Lyman alpha of hydrogen, 1216 Å, was measured with photon counters and with a thermoluminescent phosphor, and solar X-rays from 5–7 Å were observed by these methods and also by direct photography through filters. The absorption of X-rays was found to occur in the E layer and must account, at least in part, for its production. (*Same item as* 5.1–57, Jan. 1954, *Met. Abstr.*) *Subject Headings:* **1. Spectroscopy 2. Rocket research.**—*Author's abstract.*

11I–37 551.507.362.1:551.510.5

Wegener, Kurt, **Die Erforschung der Atmosphäre durch die Rakete.** [Investigation of the atmosphere by rocket.] *Geofisica Pura e Applicata*, 24:68–70, Jan./April **1953.** 2 refs. English summary p. 68. **DLC**—Rocket measurements of temperature cannot be made accurately by current techniques but must be based on the propagation of sound. The solar constant and spectrum must also be recalculated considering rocket measurements of the ultrashort waves which are not all intercepted on a normal surface as are larger solar radiations, but are deflected by the earth's magnetic field. (*Same item as* 5.6–52, June 1954, *Met. Abstr.*) *Subject Headings:* **1. Rocket soundings 2. Ionospheric temperature measurement 3. Solar constant corrections 4. Acoustical temperature determination.**—*M.R.*

1954

11I–38 551.507.362.1:551.510.53

*†Boyd, R. L. F.; Seaton, M. J. (*both, Univ. Coll., London*) and Massey, Harrie, S. W. (*eds.*), **Rocket exploration of upper atmosphere.** Special supplement to the *Journal of Atmospheric and Terrestrial Physics*, Vol. 1, London, Pergamon, **1954.** 376 p. numerous figs. (incl. photos), tables, refs., and eqs. On t-p: Papers included in this volume were read at a conference arranged by the Upper Atmosphere Rocket Research Panel of the United States and by the Gassiot Committee of the Royal Society of London. **DLC** (QC879.B68), **DWB.** Contains the following articles:

I. ROCKET TECHNIQUES

O'Day, Marcus D. (*U. S. A. F. Cambridge Res. Ctr.*), **Upper air research by use of rockets in the U. S. Air Force.** p. 1–10.–The experimental techniques developed and the scientific investigation of properties of the upper atmosphere during the research program are discussed in this study. (For fuller abstract, *see* 6.11–121, Nov. 1955, *Met. Abstr.*)

Bedinger, J. F. (*U. S. A. F. Cambridge Res. Ctr.*), **Day airglow measurements with rocket-borne photometer.** p. 10–16. 6 figs., 3 tables.—Measurements have been made up to 135 km, with photoelectric photometers employing interference filters. Diurnal variations in the day glow were obtained. (For fuller abstract, *see* 6.10–164, Oct. 1955, *Met. Abstr.*)

Minzner, Raymond A.; Dubin, Maurice and Beth, Eric W. (*all, U. S. A. F. Cambridge Res. Ctr.*), **Ambient temperature determinations from yawing rockets in the presence of winds.** p. 17–26. 3 figs., 6 refs., 36 eqs.—Two physical measurements on the surface of a rocket and trajectory data determine two kinds of ambient temperature and limited wind information. (For fuller abstract, *see* 6.11–120, Nov. 1955, *Met. Abstr.*)

Dubin, M. (*U. S. A. F. Cambridge Res. Ctr.*), **Meteor impacts by acoustical techniques.** p. 26–27. fig.—Description of two methods used to detect meteorites encountered by rockets in the upper atmosphere. (For fuller abstract, *see* 8H–40, Aug. 1957, *Met. Abstr.*)

Green, Charles F. (*General Electric Co.*), **Utilization of the V-2 (A-4) rocket in upper atmosphere research.** p. 28–45. 13 figs., table.—General review of the program conducted during the years 1946–1951 with sixty-nine V-2 rockets. (For fuller abstract, *see* 7.6–81, June 1956, *Met. Abstr.*)

Rosen, Milton W. and Snodgrass, Richard B. (*both, Naval Res. Lab., Wash., D. C.*), **The high altitude sounding rocket.** p. 46–52. table, 7 refs.—Information referring to the Aerobee and Viking sounding rockets. Techniques for observing flights and for recovering information are also included. (For fuller abstract, *see* 7.7–96, July 1956, *Met. Abstr.*)

Van Allen, James A. and Gottlieb, Melvin B. (*both, State Univ. of Iowa, Iowa City*), **The inexpensive attainment of high altitude with balloon-launched rockets.** p. 53–64. 6 figs., table, 4 refs., 4 eqs.—The paper treats the scheme of a balloon carried rocket (rockoon) and the firing of this rocket in a near-vertical direction to eliminate aerodynamic resistance of the lower atmosphere. (For fuller abstract, *see* 6.11–22, Nov. 1955, *Met. Abstr.*)

Berning, Warren W., (*Ballistic Res. Labs., Aberdeen Proving Ground, Md.*), **Trajectory measurements for rockets used in upper atmosphere research.** p. 65–72. 8 figs.—Optical and electronic instrumentation for the tracking of high altitude rockets are briefly described. (For fuller abstract, *see* 6.11–117, Nov. 1955, *Met. Abstr.*)

II. PRESSURES, TEMPERATURES AND WINDS

LaGow, Herman E. (*Naval Res. Lab., Wash., D. C.*), **Physical properties of the atmosphere up into the F-layer.** p. 73–81. 5 figs., 13 refs.—Immediately following World War II some of the V-2 rockets were used for atmospheric research investigations. These earlier methods and instrumentations are described. The results obtained on the nine rockets that were fired from Oct. 1946 to May 1950 are discussed in this report. On Aug. 7, 1951 at 219 km a peak altitude density of $1.0 \pm 0.2 \times 10^{-7}$ gm/m^3 was obtained. Wind was detected at 200 km. Other details on the physical properties of the atmosphere such as temperatures, pressures and densities are reported in detail.

Spencer, N. W. and Dow, W. G. (*both, Dept. of Elec. Eng., Michigan Univ., Ann Arbor, Mich.*), **Density-gauge methods for measuring upper-air temperature, pressure, and winds.** p. 82–97. 14 figs., 9 refs.—Rocket instrumentation methods using air density gages for determination of upper air temperature, pressure and density are described. Tentative results are given of direct temperature determinations using alphatron gages and cone aerodynamics for Aerobee rockets, 1949 to 1952; temperatures derived from V-2 rocket pressure measurements using thermionic ionization gages (1946–1949) are presented. Ionization gage evidence is shown of the existence during one V-2 flight of a horizontal wind stratum, and a method is described for using cone aerodynamics to determine winds. A d.c. and a v.h.f. voltage breakdown method for air density determination are described. The engineering design reliability problem in rocket instrumentation is emphasized; parachute recovery of data and instruments is briefly discussed.

Michigan. Univ. Signal Corps Upper Atmosphere Research Project. **Falling sphere method for upper air density and temperatures.** p. 98–107. 9 figs., table, 8 refs.—A method of calculating upper atmosphere densities and temperatures from the measured velocities and accelerations of a falling sphere is described. The paper gives information concerning sphere apparatus and the DOVAP (Doppler radar) tracking system. Equations are given, and sources and magnitudes of errors are discussed. The results from one Aerobee flight are shown, and this flight and two others from which the data are being reduced are described.

Kaiser, T. R. (*Jodrell Bank Experimental Station, Univ. of Manchester*), **A new technique in upper atmospheric research.** p. 108–111. 2 figs., 12 refs., 2 eqs.—Values of atmospheric pressure, scale height and wind velocity as a function of height (within a somewhat restricted range of about 90 km) may be deduced from radio echo measurements of meteor heights and range drifts. (*Same item as* 8H–104, Aug. 1957, *Met. Abstr.*)

Liller, William and Whipple, Fred L. (*both, Harvard Coll. Obs.*), **High-altitude winds by meteor-train photography.** p. 112–130. 11 figs., 6 tables, 9 refs.—The measurements of wind velocities obtained from the motions of five photographic persistent meteor-trains in the range from 81 to 113 km and the instrumentation are presented. (For fuller abstract, *see* 6.8–266, Aug. 1955, *Met. Abstr.*)

Beynon, W. J. G. and Thomas, L. (*both, Dept. of Physics, Univ. Coll. of Swansea*), **Traveling disturbances in region F_2 and magnetic activity.** p. 131–132. fig., 3 refs.—A brief analysis of the results of a series of simultaneous normal incidence ionospheric records, made at Slough, Swansea and Bangor. (For fuller abstract, *see* 11D–17, April 1960, *Met. Abstr.*)

Weisner, Allan G. (*Signal Corps Eng. Labs., Fort Monmouth, N. J.*), **The determination of temperatures and winds above thirty kilometers.** p. 133–142. 9 figs., 7 refs., 14 eqs.—Between July 1950 and Nov. 1951 the Signal Corps Engineering Laboratories, White Sands Proving Grounds, N. Mex. (lat. 32°N) conducted a series of experiments on atmospheric temperature and wind measurements. A total of 32 values of temperature and wind velocity were obtained from 6 rocket flights. This communication contains a preliminary report on the instrumentation, methods of operation and a graphical presentation of the results as well as a discussion on the successes made.

III. COMPOSITION OF HIGH-ATMOSPHERE

Michigan Univ. Upper Atmosphere Research Project, **The measurement of diffusive separation in the upper atmosphere.** p. 143–156. 12 figs., 4 tables, 13 refs.—The experimental technique of collecting air samples in the upper atmosphere in steel bottles carried aloft in rockets is described. (For fuller abstract, *see* 6E–159, May 1955, *Met. Abstr.*)

Paneth, F. A. (*Londonderry Lab. for Radiochemistry, South Road, Durham*), **The chemical analysis of atmospheric air.** p. 157–158.—Measurements were made of the A/N_2, Ne/N_2, and He/N_2 ratios to determine gravitational separation in the stratosphere. (For fuller abstract, *see* 6E–170, May 1955, *Met. Abstr.*)

Reasbeck, P. and Wiborg, B. S. (*both, Londonderry Lab. for Radiochemistry, Univ. of Durham*), **Chemical analysis of upper atmosphere air samples from 50 km to 93 km height.** p. 158–161. 2 tables, 3 refs.—Samples of air from 50–93 km obtained by means of V-2 and Aerobee rockets have been analyzed for oxygen, nitrogen, helium, neon and argon amounts. (For fulier abstract, *see* 6E–195, May 1955, *Met. Abstr.*)

Martin, G. R. (*Londonderry Lab. for Radiochemistry, South Road, Durham*), **The composition of the atmosphere above 60 km.** p. 161–168. 4 figs., table, 6 refs., 5 eqs.—Evidence suggests that there is no substantial variation in atmospheric composition at least to heights of 90 km. (For fuller abstract, *see* 6E–194, May 1955, *Met. Abstr.*)

Townsend, John W., Jr.; Meadows, Edith B. and Pressly, Eleanor C. (*all, Naval Res. Lab., Wash., D. C.*), **A mass spectrometric study of the upper atmosphere.** p. 169–188. 14 figs., table, 9 refs.—A spectrometer, installed in an Aerobee rocket measured the relative abundance of all gases between mass numbers 54 and 6 on the ascent and descent of the rocket. (For fuller abstract, *see* 6E–197, May 1955, *Met. Abstr.*)

Johnson, F. S.; Purcell, J. D. and Tousey, R. (*all, Naval Res. Lab., Wash., D. C.*), **Studies of the ozone layer above New Mexico.** p. 189–199. Vassy, E., **Remarks,** *Ibid.*, p. 200–201. 8+1 figs., table, 13+6 refs. Vertical distribution of ozone obtained by solar spectroscopic methods from rockets is discussed. (For fuller abstract, *see* 6E–192, May 1955, *Met. Abstr.*)

Regener, E.; Paetzold, H. K. and Ehmert, A. (*all, Max Planck Inst. für Physik der Stratosphäre, Weisenau bei Ravensburg*), **Further investigations on the ozone layer.** p. 202–207. 8 figs., 8 refs.—Results of observations of ozone concentrations are presented, carried out by the following methods: 1) balloon ascents, 2) lunar eclipse method, 3) chemical methods. (For fuller abstracts, *see* 6E–196, May 1955, *Met. Abstr.*)

Kay, R. H. (*Clarendon Lab., Oxford*), **The measurement of ozone vertical distribution by a chemical method to heights of 12 km from aircraft.** p. 208–211. fig., 2 tables, 2 refs.—Observations made by means of Ehmert's method are described. (For fuller abstract, *see* 10F–9, June 1959, *Met. Abstr.*)

Vassy, E., **Notes on French Ministry of Supply Rocket Research Programme.** p. 212–213. 2 illus. —A French rocket the "Veronique," 6 m long, 55 cm in diameter, weighting 1 ton and able to carry 50 kg pay-load, has been designed for investigations in the upper atmosphere. The apex of its trajectory can be extended from the present 60 km to 100 km. The launching tests are made near Colomb Bechar, in the Sahara. Other details and future plans are included.

IV. IONOSPHERE, SOLAR RADIATION, GEOMAGNETIC VARIATIONS

Seddon, J. Carl (*Naval Res. Lab., Wash., D. C.*), **Propagation measurements in the ionosphere with the aid of rockets.** p. 214–222. 10 figs., 5 refs.—A method of determining the harmonic-frequency system is described and is considered the best means of probing the secrets of the ionosphere when used with rockets. (For fuller abstract, *see* 11E–141, May 1960, *Met. Abstr.*)

Lien, J. R.; Marcou, R. J.; Ulwick, J. C.; Aarons, J. and McMorrow, D. R. (*all, Geoph. Res. Directorate, Air Force Cambridge Res. Ctr., Cambridge, Mass.*), **Ionosphere research with rocket-borne instruments.** p. 223–239. 17 figs., table, 14 refs., 7 eqs.—The article deals with the measurement of effective electron density, collisional frequency, and propagation modes made by a series or rocket flights and with the results obtained. (For fuller abstract, *see* 6.8–162, Aug. 1955, *Met. Abstr.*)

Hok, Gunnar and Dow, W. G. (*both, Electrical Eng. Dept., Michigan Univ.*), **Exploration of the ionosphere by means of a Langmuir-probe technique.** p. 240–246. 6 figs., 5 refs.—The measurements proved the increase of the positive ion current with altitude. (For fuller abstract, *see* 11D–58, April 1960, *Met. Abstr.*)

Bergman, C. W.; Macmillan, R. S. and Pickering, W. H. (*all, Calif. Inst. of Technology*), **A new technique for investigating the ionosphere at low and very low radio frequencies.** p. 247–255. 9 figs., 2 refs.—A continuous wave phase measuring technique for ionospheric observations is described. (For fuller abstract, *see* 6D–299, April 1955, *Met. Abstr.*)

Singer, S. F. (*Physics Dept., Md. Univ.*), **Rocket exploration of magnetic fields and electric currents in the upper atmosphere.** p. 256–260. fig., 16 refs.—Rocket measurements at the magnetic equator established the existence of electric current which is responsible for many of the geomagnetic variations observed at sea level. (For fuller abstract, *see* 7.7–265, July 1956, *Met. Abstr.*)

Berning, Warren W. (*Ballistic Res. Labs., Aberdeen Proving Ground, Md.*), **The determination of charge density in the ionosphere by radio Doppler techniques.** p. 261–273. 6 figs., ref., 20 eqs.—An analysis of the electron density measurements in the ionosphere using the DOVAP system showing the accuracy limitations in the method. (For fuller abstract, *see* 6.8–127, Aug. 1955, *Met. Abstr.*)

Byram, E. T.; Chubb, T. and Friedman, H. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **Solar X-rays and E-layer ionization.** p. 274–275. fig., 10 refs.—Rockets in the E region detected solar X-rays by means of photon counters, the intensity data were telemetered to ground. (For fuller abstract, *see* 6.8–132, Aug. 1955, *Met. Abstr.*)

Byram, E. T.; Chubb, T. and Friedman, H. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **The study of extreme ultraviolet radiation from the sun with rocket-borne photon counters.** p. 276–278. fig., 11 refs.—Brief description of measurements of the intensity of the extreme solar ultraviolet spectrum (1050–1250 Å) at heights from 70–100 km. The absorption of the Lyman alpha line of the sunlight in the upper atmosphere is also considered. (*Same item as* 7.4–178, April 1956, *Met. Abstr.*)

Johnson, F. S.; Purcell, J. D.; Tousey, R. and Wilson, N. (*U. S. Naval Res. Lab., Wash., D. C.*), **The ultraviolet spectrum of the sun.** p. 279–288. 10 figs., 12 refs.—The paper discusses results of rocket-borne spectrographs. Spectra were obtained to 2100 Å, and traces of the spectrum extended to 1700 Å. (For fuller abstract, *see* 8.11–181, Nov. 1957, *Met. Abstr.*)

Minnis, C. M. (*D. S. I. R. Radio Res. Station, Slough*), **Contribution to discussion on solar radiation.** p. 289–290. table.—Report of observations made in Central Africa (in Khartoum and Ibadan) during the total eclipse of the sun in 1952. Electron density at the E-peak has been also measured. (For fuller abstract, *see* 11.2–284, Feb. 1960, *Met. Abstr.*)

Bartels, J. (*Geoph. Inst., Göttingen*), **Remarks on geomagnetic variations.** p. 291. 3 refs.—Series of data on solar radiation have been received from various geomagnetic observations. From these data some positive correlations have been established between the K-index and the speed of ionospheric winds. This paper has refined the wave and particle radiation information that was made available during the past 100 years.

Chapman, Sydney (*Queen's Coll., Oxford, and Geoph. Inst., Univ. of Alaska*), **Rockets and the magnetic exploration of the ionosphere.** p. 292–305. 3 figs., 10 refs.—Rocket-borne magnetometers mainly measure the magnitude of geomagnetic intensity. It is suggested by the author that five types of rocket magnetic measurements should be made, the first four during magnetic storms. (For fuller abstract, *see* 6.8–135, Aug. 1955, *Met. Abstr.*)

V. ROCKET COSMIC RAY MEASUREMENTS

Johnson, C. Y.; Davis, L. R. and Siry, J. W. (*all, Naval Res. Lab., Wash., D. C.*), **Cosmic ray measurements in rockets.** p. 306–312. 6 figs., 2 tables, 11 refs.—Measurements made at geomagnetic latitude $\lambda = 41°N$ found that primary intensity is 0.70 ± 0.0005 particle per cm^3-sec-sterad. At the same latitude primary gamma radiation in the energy range 0.1–90 MeV was observed. (For fuller abstract, *see* 7D–116, April 1956, *Met. Abstr.*)

VI. LABORATORY STUDIES

Ditchburn, R. W. (*Physics Dept., Reading Univ.*), **Ultra-violet radiation absorption cross-sections.** p. 313–326. 7 figs., 2 tables, 49 refs., 6 eqs.—The significance of radiation absorption cross sections, the cross sections for atoms, the effect of autoionization and effects in F_2, F, E and D layer ionization are discussed. (For fuller abstract, *see* 6E–191, May 1955, *Met. Abstr.*)

Ditchburn, R. W.; Bradley, J. E. S.; Cannon, C. G. and Munday, G., (*all, Physics Dept., Reading Univ.*), **Absorption cross-sections for Lyman α and neighbouring lines.** p. 327–334. 5 figs.,

table, 15 refs.—The measured values of the absorption of the Lyman α line (1215.7 Å) in O_2, N_2, H_2O (vapor), CH_4 and air are presented. The variation of the absorption coefficient of O_2 with pressure in the range 0.5–20 mm, and the variation with wavelength for the range 1200–1230 Å has been investigated. (For fuller abstract, *see* 8.1–220, Jan. 1957, *Met. Abstr.*)

Pearse, R. W. B. (*Imperial Coll. of Science and Technology, London*), **The ultraviolet X-ray spectrum of the sun. Some laboratory investigations.** p. 335.—A few brief remarks on the Imperial College research program on molecular and atomic spectra in the ultraviolet and vacuum ultraviolet regions of the spectrum have been presented. Most of the work so far has been done with 1 m grating spectrograph but the construction of a 3 m spectrograph is being planned.

Boyd, R. L. F. (*Dept. of Physics, Univ. Coll., London*), **Some problems in the use of ion and electron probes.** p. 336–338. ref., eqs.—Six principal considerations of the difference between the probe action in a laboratory and the one on a rocket have been enumerated. The results of these considerations intend to reverse the existing problems to that of the mechanism of positive ion collection in an electronegative plasma. This is discussed in detail.

Fundingsland, O. T.; Faire, A. C. and Penico, A. J. (*all, U. S. A. F. Cambridge Res. Ctr.*), **Laboratory studies of slow electron collision in gases by microwave methods.** p. 339–346. 6 figs., 8 refs. eqs.—This paper is a comprehensive discussion of a laboratory experiment on cross-modulation. The transfer of modulation from a disturbing transmitter $D(\omega_2)$ to a radio wave $W(\omega_1)$ occurring in the ionized region of interaction because the modulated signal ω_2 causes the electronic conductivity of the region to vary rhythmically. Brief mention is made of two other experiments in progress.

VII. THEORY AND FUTURE RESEARCH

Bates, D. R. (*Queen's Univ., Belfast, N. Ireland*), **Considerations of the results obtained by rockets.** p. 347–355. 39 refs., 3 tables, 11 eqs.—The critical examination of measurements made during rocket flights from the viewpoint of the theorist is discussed in correlation to the ion concentration and the atmospheric structure. (For fuller abstract, *see* 6E–150, May 1955, *Met. Abstr.*)

Nicolet, Marcel (*I. R. M., Uccle, Belgium*), **Atmospheric motions and the dissociation of oxygen in the high atmosphere.** p. 357–360. 2 tables, 12 refs., 10 eqs.—By studying the departure from conditions of photochemical equilibrium, it is found that the molecular oxygen distribution between 100 km and 150 km follows the distribution of the main atmosphere and depends on mixing effects. The concentration of O_2 molecular is $1(125 \pm 25)$ of the global concentration. (*Same item as* 6E–164, May 1955, *Met. Abstr.*)

Nicolet, Marcel (*I. R. M., Uccle, Belgium*), **Diffusion of nitrogen atoms and oxygen molecules in region F.** p. 361–365. 16 refs., 15 eqs.—The downward motion of nitrogen atoms below 200 km indicates an increase in the effective rate of production of the atomic nitrogen at lower heights and shows that all the nitrogen molecules cannot be dissociated. In region F the loss of oxygen molecules is balanced by an upward diffusive transport. (For fuller abstract *see* 6E–165, May 1955, *Met. Abstr.*)

Gold, T. (*Royal Greenwich Obs., Herstmonceaux*), **Suggestions for rocket astronomy.** p. 366–367.—It is possible to discover a feasible range of phenomena, like the magnetic storms, and others that result from a gaseous stream from the sun impinging on the earth's magnetic field. In order to discover a shockwave light the situation must be within $\frac{1}{2}$ hr of any sudden commencement from the midnight side of the earth. Other suggestions are given.

Singer, S. F. (*Physics Dept., Md. Univ.*), **Astrophysical measurements from an artificial earth satellite.** p. 368–370. 2 figs.—The possibilities are discussed of using an artificial earth satellite for the study of 1) solar ultraviolet and X-rays, 2) the primary cosmic radiation, and 3) solar corpuscular stream. (*Same item as* 7.1–216, Jan. 1956, *Met. Abstr.*)

Singer, S. Fred, **Investigation of the solar corona by means of rockets.** p. 371–374. fig., 6 refs.—This kind of measurement has two principal advantages: 1) the background of scattered light from the atmosphere is substantially reduced, and 2) the region of wavelength available for observations from the infrared into the ultraviolet is increased. (For fuller abstract, *see* 7.7–97, July 1956, *Met. Abstr.*) *Subject Headings:* **1. Rocket exploration of upper atmosphere 2. Upper atmosphere physics 3. Upper air data.**—*E.K.*

11I–39 551.506.7(789)

*Brasefield, C. J. (*U. S. Signal Corps Engr. Lab., Fort Monmouth, N. J.*), **Winds at altitudes up to 80 kilometers.** *Journal of Geophysical Research*, 59(2):233–237, June **1954.** 4 figs., 5 refs. **DWB**—Wind data have been collected at altitudes between 30 and 80 km in the course of six rocket flights at White Sands Proving Ground during 1950 and 1951. Additional wind data to altitudes as high as 40 km have been obtained since 1948 by tracking radiosondes carried aloft by special high-altitude balloons launched at Belmar, New Jersey. Day-to-day wind changes at 30 km are discussed. From the mean wind structure, inferences are drawn as to upper atmosphere temperatures at higher

latitudes. (*Same item as* 6.2–45, Feb. 1955, *Met. Abstr.*) *Subject Headings:* **1. Upper air wind data 2. Rocket measurements 3. Upper air temperatures 4. White Sands, N. Mex.**—*Author's abstract.*

11I–40 551.521.17:535.34

Curtis, John P.; Rense, William A. and Todd, Barbara, **Extreme ultra-violet research.** Colorado. Univ. Engineering Experiment Station, Contract AF 19(604)-631, Scientific Report, No. 1, March 1, 1953–March 1, **1954.** 28 p. 19 figs. (incl. photos), 2 tables, eqs. **MH-BH**—The report describes work done from March 1, 1953 to March 1, 1954 on the design, construction and calibration of a rocket spectrograph for use in aerobee flight on Oct. 7, 1953 for studying the UV spectrum of the sun. Studies were also made of the UV absorption properties of atmospheric gases. Apparatus and results are described in detail, illustrated and tabulated. The rocket flight failed, but not on account of failure of the equipment prepared under this contract. (*Same item as* 6.7–201, July 1955, *Met. Abstr.*) *Subject Headings:* **1. Ultraviolet spectrographs 2. Rocket instrumentation.**—*M.R.*

11I–41 551.510.53(02)

†Goody, R. M. (*St. John's College, Cambridge*), **The physics of the stratosphere.** Cambridge, University Press, **1954.** 187 p. 60 figs., 17 tables, bibliog. p. 176–181, eqs. Price: $5.00. (*Cambridge Monographs on Physics.*) **DLC** (QC879.G68). Transl. into Russian by S. F. Shushurin, ed. by E. G. Shvidkovskiĭ, as **Fizika stratosfery.** Issued Leningrad, Gidrometeoizdat., **1958.** 171 p. 61 figs., 17 tables, 214 refs., eqs.—A simple but up-to-date and accurate treatment of the structure, composition and energy conditions in the upper atmosphere, with emphasis on experimental rather than theoretical results. The latest equipment, including rockets, is considered. The introduction presents a brief description of the V-2 and Aerobee rockets, showing a sectional drawing of both. In the following chapters the preactical use of rocket observation is reported referring to air samples, spectra, temperature and wind measurements obtained from rocket flights. Results derived from experiments are shown in the attached tables and figures. The layer between that wherein "weather" plays an important role, and the ionosphere (e.g., from 12 to 80 km) is emphasized. The several chapters take up the following subjects: 1) Discovery and nomenclature of stratosphere; 2) Temperature and its measurements by sound propagation, meteor and rocket techniques; 3) Composition (H_2O, CO_2, rare gases, etc.); 4) Ozone; 5) Winds and turbulence in the stratosphere; 6) Radiation. The last chapter is especially complete and up-to-date, taking up the latest theoretical and experimental knowledge of the radiation balance in the stratosphere, the effects of various gases (H_2O, CO_2, NO and O_2) on the absorption of solar and terrestial radiation, line shapes, spectroscopy and, finally, the effect of radiation balance on tropopause temperatures and vice versa. (*Same item as* 5.5–5, May 1954, *Met. Abstr.*) *Subject Headings:* **I. Upper atmosphere physics textbooks. I. Shushurin, S. F.** (*transl.*) **II. Shvidkovskiĭ, E. G.** (*ed.*).—*M.R.*

11I–42 551.501.7:551.507.362.1:77

†Holliday, Clyde T. (*Johns Hopkins Univ.*), **The earth as seen from outside the atmosphere.** (In: Kuiper, Gerard P. (*ed.*), **The earth as a planet.** Chicago. Univ. of Chicago Press, **1954.** p. 713–725. 8 figs. (incl. photos), 14 refs.) **DLC**—The first successful aerial photographs were made in 1856 by M. Nadar from a captive balloon over Paris. In Oct. 1946 the earth was first photographed from a height that gave a clear picture of the earth as it would look from outside the atmosphere (V-2, No. 13 at White Sands, N. Mex.). Purpose of high altitude photography is to determine orientation of the rocket in flight to obtain meteorological and astrophysical data, and to conduct photographic reconnaissance. Usually 16 or 35 mm movie cameras or 10×12.7 cm aerial reconnaissance camera are used. Over 1000 successful photos have been obtained (96% recovery of cameras and 98% satisfactory film). Meteorologists can derive useful information on climatic or seasonal changes in earth's cover, cloud formations on a large scale, orographic effects on cloudiness, cloud streets, albedo, etc. (*Same item as* 8.3–94, March 1957, *Met. Abstr.*) *Subject Headings:* **1. Rocket photography 2. Aerial photography 3. Rocket photo-reconnaissance 4. Earth photography from outer atmosphere.**—*M.R.*

11I–43 551.510.534:551.524.7:551.507.362.1(789)

Johnson, Francis S., **Rocket observations of atmospheric ozone.** (In: American Meteorological Society and Royal Meteorological Society, **Proceedings of the Toronto Meteorological Conference, Sept. 9–15, 1953.** pub. **1954.** p. 17–26. 11 figs., table, 18 refs.) **DWB**—Measurements of atmospheric ozone concentration have been made from rockets at altitudes up to 70 km. The results have been compared with distributions calculated from photochemical theory, and the agreement is good if the three-body collision process $O+O+M \rightarrow O_2+M$ is taken into account. The absorption of solar radiation by ozone has been used to calculate the diurnal temperature changes in the altitude range 30 to 70 km above White Sands, N. Mex., for 14 June 1949 and 25 January 1951. The maximum diurnal temperature variation occurs at about 50 km altitude, in agreement with the altitude of the temperature maximum as calculated from rocket measurement of

pressure and density. (*Same item as* 6.3–53, March 1955, *Met. Abstr.*) *Subject Headings:* **1. Ozone distribution 2. Upper air temperature variations 3. Rocket soundings 4. White Sands, N. Mex.**—*Author's abstract.*

11I–44 551.510.53:551.507.362.1

†Leak, William M., **Rocket research at NRL.** *U. S. Naval Research Laboratory, NRL Report,* No. 4441, Nov. 12, **1954.** 26 p. 20 figs., table, 41 refs. **DWB**—The Navy Research Laboratory began working on upper air research on Dec. 17, 1945 in the new Rocket Sonde Research Section. The work has been expanded so that two branches now exist: 1) Rocket Sonde and 2) Rocket Development in Atmosphere and Astrophysics Div. The Optics Div. also conducts upper atmosphere and solar radiation work. About 60 scientists are now engaged in this work. Over 175 experiments have been performed with V-2, Viking, Aerobee and Deacon rocket-borne instruments. This instrumentation is described and most important results in research on ultraviolet spectra, ionosphere, geomagnetism, upper air composition, density, pressure, temperature, cosmic rays, etc. are indicated. Data on O_3 composition was obtained up to 70 km on June 14, 1949, showing maximum concentration with respect to air at 28 km (the same as on Oct. 10, 1946) though actual maximum O_3 was at 26 km (0.11 mm/km) and at 24 km (0.17 mm/km). These data and other data from 20 to 70 km agree with photochemical theories of Wulf and Deming (1936 and 1937), Dütsch (1946), Craig (1950) and Bates and Nicolet (1950) as calculated according to the method of Chapman (1930). The composition of the atmosphere from 96 to 137 km was investigated with a Bennett radio frequency mass spectrometer in an Aerobee on Feb. 12, 1953. Results of 172 traverses and analysis of samples show that ratio of argon to N_2 does not change as a function of altitude up to 137 km as would be predicted from diffusive separation theory. Some errors are suspected in these samples, however. (*Same item as* 6E–193, May 1955, *Met. Abstr.*) *Subject Headings:* **1. Rocket research 2. U. S. Naval Research Laboratory 3. Upper atmospheric composition 4. Photochemical theory of ozone.**—*M.R.*

11I–45 551.510.535

Lejay, Pierre, **Méthodes modernes de recherches sur la haute atmosphère.** [Modern methods of research on the upper atmosphere.] Conference at the Palais de la Découverte, Jan. 16, 1954. Paris, **1954.** 25 p. 5 figs. (*Conférences du Palais de la Découverte, Ser. A,* No. 192.) **DLC**—Spectroscopic rocket (direct measurement) and radio echo methods of upper atmospheric research are described, and results in terms of temperature (to 150 km), density, winds, ionization, chemical composition, oscillations and radio propagation conditions discussed in this pamphlet. *Subject Headings:* **1. Upper atmosphere research 2. Ionospheric soundings.**—*M.R.*

11I–46 551.507.362.1:551.510.53

Newell, Homer E., Jr., **Rockets and the upper atmosphere.** *Scientific Monthly,* 78(1):30–36, Jan. **1954.** 9 figs., 17 refs. **DWB**—A semitechnical résumé of the recent discoveries in upper atmosphere physics made by using various types of rockets as instrument carriers. The ozone absorption of UV light and resulting knowledge of solar emission in various spectral regions, data on density, temperature, ozone concentration, electron and ion concentrations, solar X-rays, winds and cosmic rays and other physical properties of the high atmosphere are discussed and curves presented to show quantitative relations based on latest rocket results. Detailed spectrograms of the sun in short wave lengths above the absorption layer, chemical constitution of the upper atmosphere, heights of luminous emitting layers, and standard data at higher levels than heretofore obtained are fields for future effort. (*Same item as* 6.1–9, Jan. 1955, *Met. Abstr.*) *Subject Headings:* **1. Rocket research 2. Upper atmosphere physics 3. Standard atmosphere.**—*M.R.*

11I–47 551.510.41:546.21

†Nicolet, M. and Mange, P. (*Ionosphere Res. Lab., Pa. St. Univ., State Coll., Pa.*), **The dissociation of oxygen in the high atmosphere.** *Journal of Geophysical Research,* Wash., D. C., 59(1):15–45, March **1954.** 11 figs., 9 tables, 35 refs., 49 eqs. **DWB.** Also issued as: Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(122)-44, Scientific Report No. 56, Feb. 1, **1954. DWB**—The question of the oxygen distribution in the high atmosphere is examined by studying the departure from photochemical equilibrium. An investigation of the transition region is made, utilizing recent rocket data on atmospheric transmission in the Schumann-Runge continuum of molecular oxygen. It is concluded that the molecular oxygen distribution above the dissociation region follows the distribution of the main atmosphere and depends on mixing effects. A limit for the time of mixing can be found when times of dissociation, recombination, and diffusion are considered. It is shown that the level of the mesopause is related to the dissociation of the oxygen molecule. Some suggestions are made concerning dynamical effects affecting the airglow, formation of ionospheric regions, and dissociation of nitrogen. (*Same item as* 6.3–91, March 1955, *Met. Abstr.*) *Subject Headings:* **1. Oxygen dissociation 2. Upper atmosphere.**—*Authors' abstract.*

11I–48 551.501.75:551.507.362.1

Serra, L., **Note on the utilization of smoke-producing rockets for the study of the wind.** (In: National Research Council of Canada (*comp.*), **Technical papers presented to the Wind Power Working Party (of the O.E.E.C.).** London, H.M. Stationery Office, **1954?** p. 113–119. 5 figs.) **DWB**—Wind speed and turbulence can be determined by using smoke producing rockets fired vertically. Results obtained from several tests are illustrated. *Subject Headings:* **1. Smoke-producing rockets 2. Upper air wind measurement techniques.**—*E.Z.S.*

11I–49 551.507.362.1:551.510.53

Sicinski, H. S.; Spencer, N. W. and Dow, W. G. (*Michigan Univ.*), **Rocket measurements of upper atmosphere and pressure in the 30- to 75-kilometer region.** *Journal of Applied Physics*, N. Y., 25(2):161–168, Feb. **1954.** 12 figs., 14 refs. **DWB**—A method for determining ambient temperature and ambient pressure in the upper atmosphere is described, using the properties of a supersonic flow field surrounding a right circular cone. The underlying fundamentals stem from basic aerodynamic principles as combined with the developments of the aerodynamics of supersonic cones by G. I. Taylor, J. W. Maccoll and A. H. Stone. The experiment provides the necessary cone pressures, velocities and Eulerian angles, such that a Mach number characterizing the ambient space conditions may be computed. A description is given of the requisite experimental equipment and related techniques. Experimental data from two rocket-borne equipments are presented with the resulting calculated pressures and temperatures as experienced over New Mexico to approximately 70 kilometers. (*Same item as* 5.10–52, Oct. 1954, *Met. Abstr.*) *Subject Headings:* **1. Rocket observation techniques 2. Upper atmosphere research.**—*Authors' abstract.*

11I–50 551.507.362.1

Spencer, N. W.; Schulte, H. F. and Sicinski, H. S., **Rocket instrumentation for reliable upper atmosphere temperature determination.** *Institute of Radio Engineers, I. R. E. Proceedings*, 42(7): 1104–1108, July **1954.** 6 figs., 4 refs. **DWB**—This paper describes briefly rocket-borne electronic equipment which has been developed and utilized in the determination of ambient atmospheric pressure and temperature. In the design of the equipment, emphasis has been placed on reliability of operation, and on the ability to produce data of significant accuracy. Typical resulting curves of ambient pressure and temperature are presented. (*Same item as* 6.1–59, Jan. 1955, *Met. Abstr.*) *Subject Headings:* **1. Rocket instrumentation 2. Upper air temperatures 3. Upper air pressure.**—*Authors' abstract.*

11I–51 551.521.17:535.33:551.507.362.1

†Tousey, R., **Observations of the solar ultraviolet spectrum from rockets.** *International Council of Scientific Unions, Brussels, Eighth Report of the Comission for the Study of Solar and Terrestrial Relationships.* Paris, **1954.** p. 49–57. table, 32 refs. **DWB**—The spectrographs and their control are described and 13 spectra obtained between Oct. 1946 and Feb. 1954 tabulated. The shortest wave length recorded by spectrograph is 1754 A, but thermoluminescence extends this to 1040 A. Fraunhofer lines, O_3 and O_2 absorption, Lyman Hα bands and intensity distribution are among the results described. O_3 concentration above maximum was found to decrease exponentially. The heat balance is discussed, the mean diurnal variation being 5.3°C at 48 km, falling to 1°C at 31 and 70 km. (*Same item as* 8.2–156, Feb. 1957, *Met. Abstr.*) *Subject Headings:* **1. Rocket observation techniques 2. Ultraviolet spectrum.**—*C.E.P.B.*

11I–52 551.501.7:551.510.53

Vassy, E., **La haute atmosphère.** [The upper atmosphere.] *La Météorologie*, Paris, 4th Ser., No. 35:185–194, July/Sept. **1954.** 12 figs. **DWB**—Review of different indirect methods for obtaining information on the high atmosphere (radio and sound propagation, meteors, ozone, twilight airglow and auroral data), and direct methods used since the war (rockets) to obtain density, temperature, chemical composition, ozone and mass spectrometer data. Measurement of electrical properties by means of (a) UHF; (b) the U. S. Naval Research Laboratory (NRL) method using two figures, 2.34 Mc and 25.6 Mc, or the sixth harmonic of the first, to determine ionization at 80–160 km; (c) the Langmuir method which determines that no electrons exist below 70 km, although + and − ions occur at 60 km; and (d) Doppler method are described. (*Same item as* 9.9–107, Sept. 1958, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere structure 2. Upper atmosphere research 3. Rocket soundings.**—*M.R.*

11I–53 551.521.3

†Vassy, A. and Vassy, E. (*Univ. of Paris*), **Absorption of solar radiation by the atmosphere.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 30:427–446, July **1954.** 4 figs., table, 75 refs., 10 eqs. Discussion p. 438–442. **DWB**—Two distinct methods are available for studying the absorption of solar radiation by the atmosphere. In the first method,

the intensity of solar radiation is measured at different solar zenith angles. The intensity of solar radiation, free from terrestrial absorption, and the absorption coefficient for the whole atmosphere may then be determined. Current knowledge of the absorption coefficients of the atmosphere is examined. The coefficients for ozone are fairly well known, and those for the oxides of nitrogen have recently been studied. On the other hand, the data for oxygen question the validity of the absorption law; a pressure effect has been observed for both the bands in the visible range and the remote ultraviolet. Furthermore, the absorption of atomic oxygen has not been investigated, and it seems that such a study will be difficult. Some attention is devoted to the absorption of X-rays by the atmosphere, and to the penetration of corpuscular radiation (electrons and alpha particles). Finally, the recent experimental data on radiation in the upper levels of the atmosphere, obtained by using rockets, are compared with the proposed curve. The observations are in excellent agreement with the computations in the range near 2000 Å between the two strong bands of ozone and oxygen and in fairly good agreement near 1500 Å in the maximum of the oxygen band. However, in the range near 1200 Å, the radiative energy measured is stronger than would be expected. The experimental data concerning atmospheric absorption of auroral electrons are also examined. (*Same item as* 6.8–230, Aug. 1955, *Met. Abstr.*) *Subject Headings:* **1. Atmospheric absorption 2. Absorption coefficients 3. Upper atmosphere radiation.**—*From authors' abstract.*

11I–54 551.506.7:551.507.362.1

†Whipple, Fred L. (*Harvard Col. Obs.*), **Density, pressure and temperature data above 30 kilometers.** (In: Kuiper, Gerard P. (*ed.*), **The earth as a planet.** Chicago. Univ. of Chicago Press, **1954.** p. 491–513. 7 figs., 3 tables, 19 refs.) **DLC** (QB501.K75)—A complete summary of results of recent observations of upper atmosphere pressure, density and temperature, as obtained from rocket firings. Earlier work is not reviewed. Diurnal, seasonal and latitudinal variations are discussed, and the chief results tabulated by 2, 5 or 10 km levels up to 219 km, and shown on graphs (to 160 km). Meteor and sound propagation data are also considered briefly. (*Same item as* 9.2–153, Feb. 1958, *Met. Abstr.*) *Subject Headings:* **1. Upper air data 2. Rocket data.**—*M.R.*

1955

11I–55 551.507.362.1:551.510.53

Appleton, Sir Edward, **Rocket sounding in the upper air: confirmation of results inferred from radio measurements.** *Wireless World*, London, 61(9):406–407, Sept. **1955.** 4 eqs. **DLC**—In connection with plans for the International Geophysical Year, the article briefly describes methods of measuring pressures and deducing temperatures, and of measuring electron density at a given height by the Doppler effect on the phase velocity of radio waves near the rocket emitter. (*Same item as* 7.3–102, March 1956, *Met. Abstr.*) *Subject Headings:* **1. Rocket instrumentation 2. Ionospheric electron density measurement.**—*C.E.P.B.*

11I–56 551.507.362.1:77(789)

Baumann, R. C. and Winkler, L., **Photography from the Viking 11 rocket at altitudes ranging up to 158 miles.** *U. S. Naval Research Laboratory, Rocket Research Report*, No. 18; *NRL Report*, No. 4489, Feb. 1, **1955.** 8 p. 3 refs., table, 14 photos. **DWB**—On May 24, 1954, Viking 11 was launched at White Sands Proving Ground, New Mexico. The research equipment in the rocket included an aircraft camera, which took 39 pictures at altitudes varying from 65 mi on the ascent, through the peak of 158.4 mi, to 33.3 mi on the descending portion of the trajectory. Great care in focusing the camera lens produced photographs with excellent definition. A wiring difficulty caused the camera to operate in an irregular sequence, so that the time and altitude of a picture could not be established from telemetered flight data. The altitude at which the first few pictures were taken was calculated from the photos, using the focal length of the camera lens, contour maps of the area, and the rocket subpoint. After the first pictures were correlated with their timing pulses by calculations, the remainder were correlated by measuring the difference in distance between two points as they appeared on successive pictures. The 10 photos included in this report show the area near White Sands and interesting features of the earth's surface, cloud formations, and the atmospheric layer at the horizon. (*Same item as* 6.11–116, Nov. 1955, *Met. Abstr.*) *Subject Headings:* **1. Viking rockets 2. Rocket photography 3. White Sands, N. Mex.**—*Authors' abstract.*

11I–57 551.510.535:551.507.362.1(02)

Burgess, Eric, **Frontier to space.** Foreword by the Astronomer Royal, Sir Harold Spencer Jones. London, Chapman & Hall, **1955.** 174 p. numerous figs. (incl. photos), tables, 15 refs. **DLC.** Transl. into German as **Raketen in der Ionosphären forschung,** issued Garmisch-Partenkirchen, Deutsche Radar-Verlagsgesellschaft, **1956.** 192 p. 112 figs., (incl. photos), 11 tables, bibliog. p. **189–192** (*see* 9.1–12, Jan. 1958, *Met. Abstr.*)—A highly readable book giving in 8 well-illustrated chapters the latest information on rockets and rocket exploration of the high atmosphere,

and the basic scientific information gained from such studies of the ionosphere, solar and cosmic radiation and the exosphere. Results gained from balloon measurements and from indirect methods are incorporated in these chapters. Evidence from meteors, the counter glow, aurora and cosmic ray measurements at the surface are especially well treated. The final chapter describes the orbital or space ship, giving many theoretical technical details which must be known and improved on before the satellite observatory becomes a reality. (*Same item as* 6.10–5, Oct. 1955, *Met. Abstr.*) *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Cosmic radiation 3. Satellite observatories 4. Aeronomy textbooks.**—*M.R.*

11I–58 551.510.535:546.21:551.507.362.1

Byram, E. T.; Chubb, T. A. and Friedman, H. (*all, U. S. N. Research Lab., Wash., D. C.*), **Dissociation of oxygen in the upper atmosphere.** *Physical Review*, N. Y., 98(6):1594–1597, June 15, **1955.** 6 graphs, 13 refs., 4 eqs. **DWB**—The molecular oxygen content of the upper atmosphere between 110 and 130 km was determined by measuring the transmission of solar radiation in a narrow wavelength band from 1425 to 1500 Å. The radiation was detected by means of an ultraviolet photon counter flown in an Aerobee rocket. At 130 km the concentration of O_2 was 10^{10} per cc. On the basis of the Rocket Panel density scale, 12% of the atmospheric oxygen was still undissociated. (*Same item as* 7.6–109, June 1956, *Met. Abstr.*) *Subject Headings:* **1. Oxygen dissociation 2. Ionospheric composition 3. Rocket data.**—*Authors' abstract.*

11I–59 551.507.362.1

Hammond, Rolt, **Rockets for atmospheric research.** *Instrument Practice*, 9(5):427–430, May **1955.** 2 figs., 4 refs. **DLC**—History of German war rockets and White Sands research rockets, and results obtained with the latter, are set out. The thermionic and alphatron ionization gages are illustrated. The Aerobee and "rockoon," and methods of measuring temperature and wind velocity by sound waves, are described. (*Same item as* 6.11–119, Nov. 1955, *Met. Abstr.*) *Subject Headings:* **1. Rockets 2. Rockoons.**—*C.E.P.B.*

11I–60 551.515.21:551.507.362.1(764)

Hubert, L. F. (*U. S. W. B., Wash., D. C.*) and Berg, Otto (*Naval Research Lab., Wash., D. C.*), **A rocket portrait of a tropical storm.** *Monthly Weather Review*, Wash., D. C., 83(6):119–124, June **1955.** 5 figs. (incl. photos), 4 refs. **DWB, DLC**—Photographs taken on Oct. 5, 1954, from an Aerobee rocket fired from White Sands, N. Mex., are presented which show the cloud patterns of a tropical storm near Del Rio, Tex., and a secondary vortex over southwestern New Mexico. The method and purpose of obtaining these photographs are discussed. Detailed surface-pressure and 300-mb isotach and streamline analyses reveal features of the circulation missed by the usual contour analysis. This illustrates some possible shortcomings of our routine analysis and the utility of rocket photo-reconnaissance. (*Same item as* 7I–164, Sept. 1956, *Met. Abstr.*) *Subject Headings:* **1. Rocket photo-reconnaissance 2. Tropical cyclone cloud photography 3. Texas.**—*Authors' abstract.*

11I–61 551.521.17:523.77:551.507.362.1(789)

Jursa, A. S.; LeBlanc, F. J. and Tanaka, Y. (*all, U. S. A. F. Cambridge Res. Center, Air Res. and Dev. Command*), **Results of a recent attempt to record the solar spectrum in the region of 900–3000 A.** *Optical Society of America, Journal*, 45(12):1085–1086, Dec. **1955.** fig., 5 refs. **DWB, DLC**—Solar spectra in the 2000 Å to 3000 Å range obtained on rocket flights were reported by Tousey and others in 1953 and 1954. This note gives results of an Aerobee flight to 122 km on March 29, 1955 at Holloman Air Development Center, N. Mex., using a spectrograph with 40-cm, 15,000 lines per in. grating and normal incidence, designed for a range from 900–3000 Å. One of 7 spectra thus obtained at 94–112 km is reproduced. Lines between 2090 and 1548 Å are weak and indistinct compared with those >2100 Å. A Lyman α line shows up at about 1200 Å. No Lyman β lines showed up, probably because of short exposure time. Broad absorption lines appear at 1848, 1851, 1932 and 1937 Å. (*Same item as* 8.8–223, Aug. 1957, *Met. Abstr.*) *Subject Headings:* **1. Solar spectra, 1200–2100 Å 2. Rocket spectrograph observations 3. Holloman Air Development Center, N. Mex.**—*M.R.*

11I–62 551.510.41:551.510.53

Michigan. Univ. Engineering Research Institute, **Collection and analysis of upper-air samples.** Contract DA-36-039 SC-56737, Project DA 3-99-07-022, Project SC 172B, Quarterly Reports, No. 1, 2, 3, 4, Oct. 15, 1954–Oct. 15, 1955: and Final Report, Oct. 15, 1954–Dec. 31, **1955.** issued Feb. 15, **1955**–Feb. **1956.** 5 pieces. about 10 p. each. figs. (incl. photos), tables, refs., eqs. **DWB** (M10.53 M624c)—This series of brief technical reports gives the details of the development of a selective adsorption gas analyzer for measuring the helium and neon content in upper air samples obtained at the peak of an Aerobee rocket sounding (30,700 km). A study was also made of the

possibility that "separation" was a result of flow phenomena during sampling. Sampling bottles which were developed in a previous contract, have been improved along with methods of sampling. Details of equipment are shown in illustrations. (*Same item as* 9.3–164, March 1958, *Met. Abstr.*) *Subject Headings:* **1. Upper air sampling and analysis 2. Helium in upper atmosphere 3. Neon in upper atmosphere 4. Aerobee rocket instrumentation. I. Jones, L. M. II. Wenzel, E. A.**—*M.R.*

11I–63 551.524.7:551.510.535

†Newell, Homer E., Jr. (*U. S. Naval Research Lab., Wash., D. C.*), **Temperatures in the upper atmosphere.** (In: American Institute of Physics, **Temperature, its measurement and control in science and industry,** Vol. 2 (Oct. 1954 Symposium), pub. **1955.** p. 429–444. 8 figs., 2 tables, 40 refs.) **DWB, DLC**—The NACA tentative standard atmosphere, and results of more recent methods of determination of temperatures to 100 or 200 km in the upper atmosphere are discussed, illustrated and curves presented to show values. The anomalous propagation of sound, meteor trail photography or radio echoes from ionized meteor columns, ionospheric scale heights, spectroscopic studies of airglow and aurora, calculations of ozone heating, atmospheric oscillations and escape of He are among the indirect methods, and soundings by means of rockets (pressure on side, on nose cone, at nose tip, absorption of UV light in atmosphere, pressure modulation on rolling rocket, transit time of sound waves, trajectory of falling spheres or shock wave angle) and, finally, rocket grenade methods are examples of more or less direct methods where either pressure, temperature, or density (and eventually temperature) can be determined. Diurnal changes are greatest at about 50 km, but more about rate of cooling and extreme diurnal changes must be learned before curves can be improved. *Subject Headings:* **1. Upper atmosphere temperatures 2. Indirect aerology.** —*M.R.*

11I–64 551.507.362.1:551.506.7(73/9)

*†Newell, Homer E., Jr. (*U. S. Naval Research Lab.*), **Rocket data on atmospheric pressure, temperature, density, and winds.** *Annales de Géophysique,* Paris, 11(2):115–144, April/June **1955.** 25 figs., 4 tables, 41 refs., 5 eqs. **DLC**—A comprehensive review of all of the important results obtained by rocket observations of pressure, density, temperature and wind since 1945, at White Sands and other places by the U. S. Navy, Signal Corps and Air Force. Rockets are illustrated and curves presented showing latest estimates of structure of these elements to 220 km in some cases. Data over the equator and at high latitudes are compared with those over New Mexico. Discussion includes: heating by ozone, measurement of pressure by X-rays, rocket grenade experiments (sound speed), the falling sphere experiment, the shock wave angle experiment, and U.S.A.F.—University of Michigan data obtained from impact pressure at the nose of an Aerobee. Not enough data exist to settle problems of diurnal vs seasonal and geographic variations. (*Same item as* 7.10–81, Oct. 1956, *Met. Abstr.*) *Subject Headings:* **1. Rocket data 2. Upper air data 3. United States.** —*M.R.*

11I–65 551.507.362.1:551.515.2(789)

Pressly, E. C.; Smith, C. P. and Townsend, J. W., Jr., **Aerobee-hi report No. 1, the RTV-N-10b firing.** *U. S. Naval Research Laboratory, NRL Report* No. 4576, *Upper Atmosphere Research Report,* No. 24, Sept. 8, **1955.** 33 p. 16 figs., 3 tables, 4 refs., 13 eqs. **DWB**—A modified RTV-A-1A Aerobee was successfully fired on Oct. 5, 1954 to obtain data for use in designing and developing the Aerobee-Hi rocket. A camera loaded with color film obtained a picture of a tropical cyclone in the Rio Grande Valley. The rocket reached 98 mi. Details of design, instrumentation, firing, descent of equipment, performance, etc. are given in text, graphs, photos. A wind of 1 mph is said to vary point of landing by >3 mi. Hence balloon runs must be made frequently for 5 hrs, before firing. If winds were constant to 100,000 ft, 75% of effect on trajectory would occur in first 2000 ft above ground. (*Same item as* 8.4–107, April 1957, *Met. Abstr.*) *Subject Headings:* **1. Aerobee rocket firings 2. Rocket hurricane photographs 3. Rocket instrumentation 4. White Sands, N. Mex.** —*M.R.*

11I–66 551.507.362.1:551.521.1

Prince, M. J. and Quirk, A. L., **Rocket instruments for the measurement of total solar radiation in the upper atmosphere.** Rhode Island. Univ. Upper Atmosphere Research Lab., Contract AF 19(122)-249, Scientific Report, No. 1, **1955.** 54 p. 14 figs. (incl. photos), 2 tables, 19 refs., eqs. **DWB**—This report summarizes the rocket phase of the program directed toward the measurement of the intensity of solar radiation in the upper atmosphere. An instrument was designed, developed and constructed for use in the nose section of Aerobee rockets equipped with a Bi-axial Pointing Control (BPC) constructed by the Univ. of Colorado. Mechanical and electrical details varied from flight to flight to fit the instrumentation into the available space of the BPC. A total of four such instruments was flown. In one of these flights the entire Aerobee nose-cone was mounted at the tip of a V-2 rocket. The other three were flown in standard Aerobee missiles. No data were

obtained in these flights due either to a failure of the vehicle or of the pointing control. Flake semiconductor bolometers were used as radiation detectors with a chopped signal to permit the use of ac amplification. Increased precision was achieved by telemetering only the part of the radiation signal above a fixed level. A description of the four instruments is given and the reasons for the changes during the development of the final instrument are discussed. Main emphasis is placed on the last two instruments. (*Same item as* 7.7–95, July 1956, *Met. Abstr.*) *Subject Headings:* **1. Solar radiation measurement 2. Rocket instrumentation 3. Bolometers.**—*Authors' abstract.*

11I–67 551.510.3:551.510.53:551.507.362.1

Smith, Haldon L.; Early, Harold C. and Spencer, Nelson W., **Rocket measurement of upper atmosphere density by Paschen's law.** Michigan. Univ. Engineering Research Institute, Contract AF 19(604)-545, Scientific Report, CS-3, May **1955.** 41 p. 15 figs. (incl. photos), foot-refs. **DWB**—The air density in the region adjacent to the surface of a supersonic cone in the upper atmosphere has been measured by means of a spark-breakdown technique based on Paschen's law. A spark gap was incorporated into the nose of an Aerobee rocket and consisted of alternate metal and dielectric laminations. The breakdown path was essentially parallel to the surface of the cone and provided for a measurement without changing the air flow past the missile. The spark-breakdown technique was evaluated by measurements taken in a large vacuum chamber, and investigations were made into the statistical deviation from the mean calibration curve, and of the consequences of initial ionization. The effects of the high air velocity upon the breakdown were also considered. The Paschen's law density measurements have been compared with data derived from Alphatron pressure gages included in the rocket instrumentation and were found to have a consistently lower value. This discrepancy is believed to be due largely to the influence of the boundary layer upon the location of the discharge path. (*Same item as* 6.11–163, Nov. 1955, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere density 2. Rocket research.**—*Authors' abstract.*

11I–68 551.596.1:551.507.362.1(789)

Stroud, W. G.; Terhune, E. A.; Venner, J. H.; Walsh, J. R. and Weiland, S. (*all, U. S. Signal Corps Engineering Labs., Ft. Monmouth, N. J.*), **Instrumentation of the rocket-grenade experiment for measuring atmospheric temperature and winds.** *Review of Scientific Instruments*, N. Y., 26(5): 427–432, May **1955.** 9 figs., table, 11 refs. **DLC**—Results of 92 grenade explosions from 15 Aerobee rocket firings from March 3, 1950 to Sept. 4, 1953 at White Sands, N. Mex., are being analyzed with respect to efficiency of this method of determining upper air temperatures and winds. From 4 to 8 grenades are exploded on each flight at specified heights (which can be determined to ±1 to 6 ft at 100,000 ft by photographic methods). The formulas $C=kT^{\frac{1}{2}}$ and $V=C+W$ are used; where C is velocity of sound due to elasticity, k is constant, T = absolute temperature, V = velocity of propagation of sound wave, and W = wind velocity. Methods, rockets, rocket instrumentation, grenade structure, flash detectors, telemetering system, safety features, sound ranging equipment, positions of grenade explosions, ground temperatures and a summary of the 15 firings are included in text, and equipment and some of the records are illustrated. The temperatures and wind can be determined for each successive layer (between grenade firings). Timing to .1 millisecond is necessary. The sound detectors are arranged so they are nearly vertically beneath each grenade when it is exploded. (*Same item as* 7.4–102, April 1956, *Met. Abstr.*) *Subject Headings:* **1. Rocket-grenade wind determination 2. Rocket-grenade temperature determination 3. Acoustical soundings 4. Aerobee rocket firings 5. Rocket instrumentation 6. White Sands, N. Mex.**—*M.R.*

11I–69 551.507.362.1:551.547:533.6.07

Sweeney, Marvin W., Jr., **Supersonic wind-tunnel measurements of surface pressures on a small rocket to be used for upper-air research.** Massachusetts Institute of Technology. Naval Supersonic Lab., Contract AF 19(604)-1208, Wind Tunnel Report, 80, Sept. **1955.** 74 p. 54 figs. (incl. photo, graphs), table, 6 refs., 23 eqs. **DWB**—It is desired to obtain high-altitude ambient pressure from a simple, inexpensive sounding rocket. It is shown in this report that this is possible by combining a nose-pitot pressure and a body-surface pressure. Wind tunnel data are presented to aid in determining the feasibility of such a method. An expression is developed for sensitivity, utilizing wind tunnel experimental data to supplement aerodynamic theory for bodies of revolution. (*Same item as* 8.3–109, March 1957, *Met. Abstr.*) *Subject Headings:* **1. Wind tunnel experiments 2. Upper air pressure 3. Rocket soundings 4. Upper atmosphere research.**—*Author's abstract.*

11I–70 551.506.22:551.507.362.1

Vassy, E. (*Faculty of Science, Univ. of Paris*), **L'exploration de la haute atmosphère avec les engins autopropulsés et le programme français de l'Année Géophysique Internationale, 1957/1958.** [Exploration of the upper atmosphere with self-propelled engines and the French program of the International Geophysical Year, 1957/1958.] *International Congress on Astronautics, 5th, Innsbruck, 1954, Bericht*, pub. **1955.** p. 221–225. **DWB** (629.1388 I61, 1954)—Problems of upper

atmosphere sounding by optical and acoustical means, recent limited rocket soundings, the First and Second Polar Year programs and the proposed IGY program (especially the rocket program) are described in this article. (*Same item as* 9.6–36, June 1958, *Met. Abstr.*) *Subject Headings:* **1. IGY networks 2. IGY rocket program 3. Rocket research.**—*M.R.*

1956

11I–71 551.501.75:551.557:551.507.362.1

aufm Kampe, H. J., **Upper-air wind measurements with small rockets.** *Journal of Meteorology*, 13(6):601–602, Dec. **1956.** Also comments by Anderson, Albert D., *Ibid.*, 14(5):473–474, Oct. **1957.** 6 refs. Reply by aufm Kampe, *Ibid.*, 14(5):474. **DWB**—In this brief study, the author suggests that the sounding of the atmosphere above 120,000 to 130,000 ft is a task for the rocket. For this purpose the promising experiments of the Loki rockets are very encouraging. Upper air wind measurements can be obtained following by radar the disposed chaff ($\frac{1}{2}$–1 lb) carried by rockets. The use of metallized parachutes ejected from rockets as a method which will supplement the chaff method is also discussed. According to ANDERSON the rocket will prove valuable in enabling to get winds above 40,000 ft, considering that most balloons are carried out of range by the winds. The Navy system offers considerable reliability to get wind measurements above 150,000 ft. In his reply AUFM KAMPE agrees with ANDERSON that rockets can be very useful also under 120,000 ft, and finds his proposal to use silver-coated balloons as radar target very good. (*Same items as* 8.5–149, May 1957 and 9.2–142, Feb. 1958, *Met. Abstr.*) *Subject Headings:* **1. Upper air wind measurement techniques 2. Rockets.**—*E.K.*

11I–72 551.510.3:551.510.53:551.524.7(789)

Bartman, F. L.; Chaney, L. W.; Jones, L. M. and Liu, V. C. (*all, Engr. Res. Inst., Univ. of Mich., Ann Arbor*), **Upper-air density and temperature by the falling-sphere method.** *Journal of Applied Physics*, 27(7):706–712, July **1956.** 6 figs., 2 tables, 7 refs., 22 eqs. **DLC**—Upper air densities are calculated from data obtained by measuring the trajectory of an inflatable nylon sphere 4 ft in diameter ejected from a rocket at its maximum height. The sphere contains a DOVAP (Doppler velocity and position) transponder and antenna. The drag equation is used to calculate the density from the sphere trajectory data. Then by rise of the hydrostatic equations and equations of state of a gas, the temperatures are obtained. The aerodynamics, instrumentation, calculations, errors due to winds, velocity, acceleration, drag coefficient, etc. are treated in detail. Results of 4 rocket ascents at White Sands during May 1952–Sept. 1953 (to 75 or 80 km) are analyzed and presented graphically. (*Same item as* 8.6–172, June 1957, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere density 2. Upper air temperatures 3. Falling sphere method 4. Rocket data 5. White Sands, N. Mex.**—*M.R.*

11I–73 551.510.535:523.77:537.531 551.507.362.1:551.521.67

Byram, E. T.; Chubb, T. A. and Friedman, H. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **The solar x-ray spectrum and the density of the upper atmosphere.** *Journal of Geophysical Research*, Wash., D. C., 61(2, Pt. 1):251–263, June **1956.** 5 figs., 3 tables, 11 refs., eqs. **DLC**—The flux density of solar X-rays arriving in the E region of the ionosphere was measured by means of photon counters in rockets. Flux densities as a function of altitude were obtained in the spectral bands 8 Å to 20 Å, 44 Å to 60 Å, and 44 Å to 100 Å. The data were extrapolated to zero air mass to give the respective flux densities in the three bands outside the atmosphere. To a first approximation, the observations may be fitted to a 700,000°K Planckian distribution of solar X-rays with a total flux density of about 0.1 erg cm^{-2} sec^{-1} at the earth. A more refined analysis reveals that it is an oversimplification to assign a single temperature to the entire corona. The shortest wave lengths, 8 Å to 20 Å, appear to have come from a hotter source, at a temperature between one and two million deg K. From the rate of X-ray absorption between 128 and 110 km and known mass absorption coefficients for air, the atmospheric density was computed to be about one-third the current Rocket Panel average values. (*Same item as* 8.3–148, March 1957, *Met. Abstr.*) *Subject Headings:* **1. Solar X-ray spectrum 2. Ionospheric density 3. Rocket research.**—*Authors' abstract.*

11I–74 551.524.7:551.507.362.1(789)

†Ference, M., Jr.; Stroud, W. G.; Walsh, J. R. et al., **Measurement of temperatures at elevations of 30 to 80 kilometers by the rocket-grenade experiment.** *Journal of Meteorology*, 13(1):5–12, Feb. **1956.** 7 figs., 2 tables, 41 refs., 6 eqs. **DWB**—Aerobee rockets ejected and exploded grenades at several predetermined intervals at White Sands, N. Mex.; explosions were photographed and arrival of sound waves at a microphone timed. The method of analysis, taking account of winds, is set out. Results of 6 ascents are given in a table and graphs. They showed no clear cut diurnal or seasonal variation but some irregularities. Two firings overlapped balloon ascents and agreed with them.

The maximum was about 266°K at 48 km. The probable error was 3%. (*Same item as* 7.8–165, Aug. 1956, *Met. Abstr.*) *Subject Headings:* **1. Upper air temperature data 2. Rocket grenade experiments 3. White Sands, N. Mex. I. Weisner, A. G.**—*C.E.P.B.*

11I–75 551.509.317:551.506.7:551.507.362.1

§Greenfield, S. M., **Synoptic weather observations from extreme altitudes.** *Rand Corporation, Santa Monica, Calif., [Papers]*, P-761, Feb. 15, **1956.** 12 p. 6 figs. **DWB**—Clouds, albedo, temperature, wind and visibility observations from a rocket at extreme altitudes can give a fair picture of synoptic conditions at ground, as illustrated by actual examples from rocket soundings in N. Mexico during 1948 and 1950. In the latter cases the situations are described in detail and comparative synoptic charts (actual and made from rocket observations) for Southwest U. S. are shown. Method suggested to supplement surface and radiosonde data where none are available. (*Same item as* 11.3–42, March 1960, *Met. Abstr.*) *Subject Headings:* **1. Rocket synoptic observations 2. Rocket soundings 3. New Mexico.**—*M.R.*

11I–76 551.557:551.524.7:551.596.1:551.507.362.1

Groves, G. V., **Introductory theory for upper atmosphere wind and sonic velocity determination by sound propagation.** *Journal of Atmospheric and Terrestrial Physics*, London, 8(1/2):24–38, Feb. **1956.** 6 figs., 9 refs., 71 eqs. **DWB**—Expressions for use with the rocket-grenade experiment are developed for finding the mean values of the horizontal wind components and of the velocity of sound for a sound-ray traveling between two points. From data of the Upper Atmosphere Rocket Research Panel, the mean velocity of sound is calculated up to 90 km. It is shown that for a nearly vertical ray received at the ground the contributions of second-order terms are less than 0.8 m/s, and for rays of any inclination generally less than 8 m/s. (*Same item as* 7.8–302, Aug. 1956, *Met. Abstr.*) *Subject Headings:* **1. Upper air wind measurement techniques 2. Upper air temperature measurement techniques 3. Sound waves 4. Rocket-grenade experiments.**—*C.E.P.B.*

11I–77 551.510.53:551.507.362.1:551.501.7

Groves, G. V., **Theory of the rocket-grenade method of determining upper-atmospheric properties by sound propagation.** *Journal of Atmospheric and Terrestrial Physics*, London, 8(4/5):189–203, May **1956.** fig., 7 refs., 61 eqs. **DWB**—The method of deducing the fields of wind, pressure, density and temperature by explosion of grenades ejected from a rocket at roughly equal space intervals, recorded by microphones at the ground (4 is the minimum) is discussed mathematically. A complete theory is formulated for analyzing the data by successive approximation. It is assumed that the Mach number of the wavefront is a known function of time along any ray, decreasing from about 2 at 100 km to unity with the expansion of the wavefront and increasing density. The order of accuracy of pressure determination at 90 km is about 3%. (*Same item as* 7.10–126, Oct. 1956, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere research 2. Rocket observation techniques.** —*C.E.P.B.*

11I–78 551.501.4:551.507.362.1

*Groves, G. V., **Effect of experimental errors on determinations of wind velocity, speed of sound, and atmospheric pressure, in the rocket-grenade experiment.** *Journal of Atmospheric and Terrestrial Physics*, 9(5/6):237–261, Nov. **1956.** 2 figs., 5 tables, 2 refs., 110 eqs. **DWB**—"Expressions are obtained for systematic and random errors in the grenade-experiment determinations of wind velocity, speed of sound, and atmospheric pressure, arising from systematic and random errors in the various quantities measured, viz. the co-ordinates and time of explosion of each grenade and the co-ordinates of each microphone and the times of arrival of the sound waves. The theory is first developed for a general distribution of microphones on the ground and of grenade bursts in the air. The results obtained are applied to the special case of four microphones, comprising a central microphone and three symmetrically placed microphones, with grenades bursting vertically above the central microphone. Under certain simplifying assumptions, expressions are obtained to show how the errors in the final determinations are related to the measurement errors, and also their dependence on the distance apart of the microphones, the spacing between the grenade bursts, and the nature of the atmospheric structure under investigation. Values are calculated for the errors that would arise in wind velocity, speed of sound, and pressure under certain typical conditions." Upper air pressure, vertical and horizontal wind speeds, and temperatures, can be accurately determined (to 1 m/s in wind and 1% pressure) if the microphones are adequately spaced. (*Same item as* 8.4–81, April 1957, *Met. Abstr.*) *Subject Heading:* **1. Rocket grenade experiments.**—*Author's abstract and C.E.P.B.*

11I–79 551.501.4:551.507.362.1

Groves, G. V., **A rigorous method of analysing data of the rocket-grenade experiment.** *Journal of Atmospheric and Terrestrial Physics*, 9(5/6):349–351, Nov. **1956.** 6 refs., eq. **DWB**—A method is described of calculating the separate contributions of wind and temperature in observations of

rocket grenades bursting at N heights. (*Same item as* 8.5–132, May 1957, *Met. Abstr.*) *Subject Heading:* **1. Rocket grenade analysis.**—*C.E.P.B.*

11I–80 551.510.3:551.524.7:551.507.362.1

Jones, L. M. and Bartman, F. L., **A simplified falling-sphere method for upper air density.** Michigan. Univ. Engineering Research Institute. Contract AF 19(604)-999, Technical Report [unnumbered], June **1956.** 89 p. 52 figs. (incl. photos), 4 tables, 16 refs., 56 eqs.—Design and construction details are presented extensively for the falling sphere, its instrumentation, launching and the results of 2 soundings, such as are contemplated for synoptic surveys, one on April 8, 1955, and one on June 24, 1955. Sphere ejection occurred at 174,000 ft and 182,000 ft, respectively, and rockets reached 356,000 and 320,000 ft. Soundings were made with a 2 stage (Nike-Deacon) rocket, at Wallops Island, Va. Calculations of the sphere trajectories (sphere altitude vs. time, sphere altitude vs. horizontal range and velocity component vs. time) shown on graphs, indicate deviation of trajectory using measured drag accelerations from that using NACA estimate for nose cone trajectory and radar data. Air densities and temperatures are also worked out to 260,000 and 228,000 ft, respectively, and compared graphically with standard values. (*Same item as* 10.7–39, July 1959, *Met. Abstr.*) *Subject Headings:* **1. Falling sphere soundings 2. Upper atmosphere temperature 3. Upper atmosphere density 4. Nike-Deacon rocket soundings.**—*M.R.*

11I–81 551.515.2:551.507.362.1

Masterson, John E. (*Geophysics Branch, ONR*), **Rocket photography of hurricanes.** *U. S. Office of Naval Research, Research Reviews,* June **1956.** p. 4–7. 2 figs. **DWB**—Photographs of hurricanes will be taken under the Rocket Photography Project from an altitude approximately 100 mi. Pictures taken from this altitude will have a radius of about 800 mi. The analysis of the photographs of the entire hurricane cloud system will enable scientists to study broad aspects of the storm. The instrumentation of the rocket and the technique of data recovery are described. Figures show the floating rocket nose cone carried by a parachute. (*Same item as* 7J–195, Oct. 1956, *Met. Abstr.*) *Subject Headings:* **1. Rocket photography 2. Hurricane photography.**—*E.K.*

11I–82 551.510.41:551.510.53:551.507.362.1:535.33(789)

Meadows, Edith B. and Townsend, John W., Jr., **Neutral gas composition of the upper atmosphere by a rocket-borne mass spectrometer.** *Journal of Geophysical Research,* Wash., D. C., 61(3):576–577, Sept. **1956.** fig., 2 foot-refs. **DLC**—The composition was measured between 74 and 142 km. Near 85 km, gases tentatively identified as nitrogen dioxide and sodium were detected. The spectrum at 84 km showed the following gases: Carbon dioxide at mass number 44, argon at 40, oxygen at 32 and 16, nitrogen at 28 and 14 and water vapor at 18, nitrogen dioxide (?) at 46 and sodium (?) at 23. The peaks at 23 and 46 were detected between 88 and 80 km and between 90 and 75 km, respectively. (*Same item as* 10.3–182, March 1959, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere composition 2. Rocket spectrometer measurements 3. New Mexico.**—*S. Fritz.*

11I–83 551.507.362.1:551.501.7

Michigan. Univ. Engineering Research Institute, **Rocket-grenade experiment for upper atmosphere temperature and winds.** Contract DA-36-039-SC-64659, Project DA-3-17-02-001, Project SC 1052A, Quarterly Reports, Nos. 1–3, May 1–July 31; Aug. 1–Oct. 31, 1955; Nov. 1, 1955–Jan. 1, 1956. issued Aug. 15, Nov. 15, **1955** and Feb. 15, **1956.** 3 pieces. About 7 to 15 p. each. **DWB** (M07.362 M624r)—Reports cover a project whose purpose was to adapt rocket-grenades for use in the Arctic during IGY and to investigate other problems of upper atmosphere research. The rocket grenade experiment was developed by the U. S. Signal Corps and successfully tested at White Sands Proving Ground. The test conducted in the present series was carried out at Camp Edwards, Cape Cod, Mass., on Dec. 6–8, 1955. The grenades were ejected ahead of the rocket at about 90,000 ft and detonated within 10–15 ft of the rocket. Theory, development, sound ranging equipment (microbarographs and hot wire microphone), DOVAP trajectory calculations, etc. are outlined and illustrated. (*Same item as* 9.3–155, March 1958, *Met. Abstr.*) *Subject Headings:* **1. Rocket-grenade experiments 2. Microbarograph sound ranging. I. Jones, L. M. II. Bartman, F. L.**—*M.R.*

11I–84 551.501.7:551.507.362.1:551.557

Reisig, Gerhard H. R., **Instantaneous and continuous wind measurements up to the higher stratosphere.** *Journal of Meteorology,* 13(5):448–455, Oct. **1956.** 14 figs., table, 5 refs., 12 eqs. **DWB**—The method, used with a guided missile, involves measuring velocity relative to the ground by tracking, pitch and yaw measured from the ground, angle of attitude of missile axis given by gyros and telemetered to the ground, and an accurate determination of "angle of attack" by an airflow meter at the nose. The theory is set out; it assumes horizontal air flow. Calculations for 3 ascents at Cape Canaveral, Fla. up to 60 km are shown as continuous graphs of wind speed and

direction and vertical wind gradient vs altitude; they give generally good agreement with radiosonde ascents up to the height reached by the latter. Maxima and minima of velocity, which alternate frequently, are shown schematically. (*Same item as* 8.2-64, Feb. 1957, *Met. Abstr.*) *Subject Headings:* **1. Upper air wind measurements 2. Rocket observation techniques.**—*C.E.P.B.*

11I-85 551.507.362.1:551.510.53

†Singer, S. Fred (*Dept. of Physics, Univ. of Maryland*), **Research in the upper atmosphere with high altitude sounding rockets.** (In: Beer, Arthur, (*ed.*), **Vistas in astronomy.** pub. London, **1955-1956.** Vol. 2:878-912. 23 figs., 3 tables, bibliog. p. 910-912.) **DLC, DWB** (520.82 B415v)—High altitude rockets have been used to investigate extra-terrestrial radiations and the properties of the atmosphere. This article surveys the outstanding results achieved in these studies, including: direct measurements of the solar ultraviolet and X radiation; composition and energy spectrum of the primary cosmic rays; the incidence of micrometeorites; the dependence on altitude up to 220 km of atmospheric pressure, density, temperature, and composition; the distribution of ozone with height; evidence on the intensity and origin of the day airglow, the electron and ion density distribution in the ionospheric layers up to 350 km; variation of the earth's magnetic field with altitude; evidence of the location of ionospheric current sheets and conclusions about the conductivity of the ionosphere; high-altitude photography and its applications. Characteristics are given of high altitude sounding rockets used in the U. S.: V-2, Aerobee, Viking and Deacon. Suggestions are made for overcoming some of their inherent limitations to allow expansion of possibilities of high altitude studies. Arguments are presented for the usefulness of instrumented artificial satellite rockets for astrophysical research. (*Same item as* 10.6-91, June 1959, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere research 2. Rocket soundings.**—*Author's abstract.*

11I-86 551.506.7:551.507.362.1:551.510.53

*Stroud, W. G.; Nordberg, W. and Walsh, J. R. (*all, Signal Corps Engr. Labs., Fort Monmouth, N. J.*), **Atmospheric temperatures and winds between 30 and 80 km.** *Journal of Geophysical Research*, Wash., D. C., 61(1):45-56, March **1956.** 5 figs., 4 tables, 9 refs., 4 eqs. **DLC**—The method and analysis of the rocket-grenade experiment are briefly described. The 59 values of temperatures and of wind speeds and directions between 30 and 80 km obtained during 12 Aerobee rocket firings are summarized. The mean temperature distribution has a maximum of about 270°K at 50 km, with a lapse rate of about 2.5°/km above the peak. The winds are strong and from the west during the winter months (Oct. through Feb.); less strong and from the east during the summer months (April through Aug.); and are comparatively weak and predominantly from the north during the fall (Sept.). The maximum wind speed measured was a value of 104 m/sec at 55 km during a winter firing. The average probable error for the temperature data is ±5°C; the average errors in wind speed and direction are ±10 m/sec and ±18°, respectively. (*Same item as* 7.11-117, Nov. 1956, *Met. Abstr.*) *Subject Headings:* **1. Rocket grenade data 2. Upper atmosphere research.** —*Authors' abstract.*

11I-87 551.510.5:551.507.362.1

Vaeth, Joseph Gordon, **200 miles up; the conquest of upper air.** 2d ed., rev. print. New York, Ronald Press Co., **1956.** 261 p. 77 figs. (incl. photos). Review by J. J. Kelly in *American Meteorological Society, Bulletin*, 38(5):307-308, May **1957. DLC**—The first edition (1951) of this book is a highly accurate account of the development and operation of many devices for exploring the upper atmosphere. The book contains chapters on upper atmosphere research, properties, rockets, constant level balloons, instruments, a general review of physical, chemical and biological characteristics of the upper atmosphere, the launching and recovery of rockets, etc. The details of instrumentation for various kind of measurements are described and illustrated. In the 2d edition, three additional chapters give the latest findings or plans for high level airplane, guided aircraft, skyhook balloon, satellite, 3-stage rocket, manual balloon and space ship exploration for astronomical, astrophysical, aerial photography, meteorological, cosmic ray and other studies outside the earth's atmosphere. About 20 new illustrations are included in the new edition. Another new project (called FATSO-First Airborne Telescopic and Spectrographic Observatory) is aimed at high level spectrophotographic and telescopic observations of the planets and moon from manned balloons. (*Same item as* 3.8-31, Aug. 1952, and 8.6-12, June 1957, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere research 2. Rocket instrumentation 3. FATSO (First Airborne Telescope and Spectrographic Observatory).** —*M.R.*

11I-88 551.557:551.507.362.1(789)

†Weisner, Allan G., **Measurement of winds at elevations of 30 to 80 kilometers by the rocket-grenade experiment.** *Journal of Meteorology*, 13(1):30-39, Feb. **1956.** 7 figs., table, 32 refs., 27 eqs. **DWB**—The rocket-grenade explosions at White Sands (*see* 7.8-165, Aug. 1956, *Met. Abstr.*) also enabled the upper winds to be determined from the sound waves. The method of analysis is set out.

The 6 ascents gave westerly winds in Oct.–Dec. and easterly in June–July. The maximum velocity (up to 104 m/s in Dec. and 89 in July) was at about 55 km. Above 55 km there was some tendency towards southerly winds. (*Same item as* 7.8–185, Aug. 1956, *Met. Abstr.*) *Subject Headings:* **1. Upper air wind measurements 2. Rocket-grenade experiments 3. White Sands, N. Mex.** —*C.E.P.B.*

1957

11I–89 551.506.22:551.507.362(47)

Programma issledovaniĭ pri pomoshchi raket i iskusstvennykh sputnikov Zemli, namechennykh Sovetskim Soiuzom k provedeniiu v techenie MGG. [Program of investigations by means of rockets and artificial satellites planned in the Soviet Union in the course of the IGY.] *Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, Informatsionnyĭ Biulleten'* No. 3:32–36, **1957. DLC**—This preliminary program provides for the use of rockets and artificial satellites for the study of: 1) the structural parameters of the atmosphere; 2) its optical properties, 3) ultraviolet and X-ray solar radiation; 4) corpuscular solar radiation and auroras; 5) cosmic rays; 6) ionospheric properties; 7) terrestrial magnetic field (short period oscillations of the magnetic field are at present said to be associated with the existence of electric current systems in the upper air); 8) micro meteors and meteors; and 9) physico-chemical processes in the upper air. *Subject Headings:* **1. Soviet participation in IGY 2. Soviet rockets 3. Soviet satellites 4. U.S.S.R.**—*A.M.P.*

11I–90 551.507.362.1:551.506.7:621.396

Alekseev, P. P. et al., **Raketnye issledovaniia atmosfery.** [Rocket studies of the atmosphere.] *Meteorologiia i Gidrologiia*, Leningrad, 8:3–13, **1957.** 6 figs. (incl. photos and diagram), table, refs., 8 eqs. **DLC.** Transl. into English by M. I. Weinreich. Available Sandia Corporation, Albuquerque, N. Mex. **DWB** (M10 A366ro)—The disposition of meteorological apparatus in the cone of a meteorological rocket, the type of apparatus, the electrical power, etc. are described in detail with the aid of a diagram. The launching of the meteorological rocket and the communication system involved in the reception of signals from the rocket are discussed. Equations are presented showing: (1) the relationship between the fundamental parameters of the radio-telemetric line, (2) the relationship between pressure within the manometer and pressure in the free atmosphere, and (3) the relationship between the temperature of the thermometer and the temperature of the ambient atmosphere. The computation of the terms of the equations and their validity with reference to the apparatus employed are illustrated. A graph and table showing the distribution of pressure, temperature and density with height as obtained from rocket measurements are presented. (*Same item as* 10.6-87, June 1959, *Met. Abstr.*) *Subject Headings:* **1. Rocket communication systems 2. Rocket measurements.**—*I.L.D.*

11I–91 551.510.41:551.507.362.1

Bates, D. R. (*Queen's Univ. of Belfast*), **Composition and structure of the atmosphere.** (In: Bates, D. R. (*ed.*), **The earth and its atmosphere,** N. Y., Basic Books, **1957.** p. 97–112. 2 figs., 2 tables.) **DLC**—The earth's atmosphere, its composition and structure, the inert gases, CO_2 and minor constituents; pressure, density and temperature aloft as determined from rockets; composition and diffusive separation; heat balance, the nitrogen cycle, etc. are discussed and illustrated by a few schematic diagrams. (*Same item as* 9.11–147, Nov. 1958, *Met. Abstr.*) *Subject Headings:* **1. Atmospheric structure 2. Atmospheric composition 3. Rocket observations.**—*M.R.*

11I–92 551.507.362.1:546.33:551.557(789)

Bedinger, J. F.; Ghosh, S. N. and Manring, E. R. (*all, G. R. D., AF Camb. Res. Ctr., Mass.*), **Emission from sodium ejected from rockets.** (In: **The threshold of space,** ed. by M. Zelikoff. N. Y., Pergamon Press, **1957.** p. 225–231. 2 figs., 3 tables.) **DLC**—Results of rocket flights with sodium evaporators are discussed. Burning iron oxide aluminum thermite mixed with sodium pellets was used for this purpose. The reactions of the sodium cloud due to upper air winds at 90–110 km height are shown. The intensity of the artificial twilight emission was about 5×10^{13} photon/cm^2 sec. A summary of possible reactions is given. *Subject Headings:* **1. Rocket experiments 2. Upper winds 3. Sodium 4. Holloman AFB, N. Mex.**—*A.A.*

11I–93 551.507.362.1:551.510.53

Blagonravov, A. A., **Issledovanie verkhnikh sloev atmosfery pri pomoshchi vysotnykh raket.** [Investigation of the upper atmospheric layers by means of high altitude rockets.] *Akademiia Nauk SSSR, Vestnik*, 27(6):25–32, June **1957.** 5 figs., 2 tables. **DLC.** Transl. by E. R. Hope into English as *National Research Council, Canada, NRC*-C2456. **DWB** (M07.362 B633st)—Many details of the Soviet meteorological rockets and of the cosmic ray, pressure, density, composition, radiation, and other experiments (including those with a dog that was catapulted out of the rocket

on descent and descended in a parachute (shown in photo), etc. are described in this informative article. Cloud photographs are also taken from 80 km or more height. (*Same item as* 10.6–89, June 1959, *Met. Abstr.*) *Subject Headings:* **1. Soviet meteorological rockets 2. Rocket exploration of the upper atmosphere.**—*M.R.*

11I–94 551.510.535:546.21:551.507.362.1

Byram, E. T.; Chubb, T. A. and Friedman H. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **The dissociation of oxygen at high altitudes.** (In: **The threshold of space,** ed. by M. Zelikoff. N. Y., Pergamon Press, **1957.** p. 211–216. 4 figs., 3 tables, 9 refs.) **DLC**—Rocket measurements were extended above 130 km to 200 km to obtain data of the dissociation of oxygen. This paper briefly reviews the photon counter technique which was used and presents some of the newer results. In a recent experiment, air density was simultaneously measured with oxygen density by observing the rate of absorption of soft X-rays. Table 2 shows the concentration of O_2 between 110–180 km, derived from three Aerobee flights. The percentage of dissociation is defined by

$$\% \text{ dissociation} = 1 - \frac{P(O_2)}{0.2\,P(\text{Air})}$$

where $P(O_2)$ is the density of molecular oxygen and $P(\text{Air})$ the density of air. The observation proved that the oxygen is far from completely dissociated at the highest altitudes reached so far. Atmospheric density obtained from X-ray transmission demonstrates that the measurements in the E region are about 2.5–3 times lower than the rocket panel density. The possibility of fitting present density results to an acceptable theory of F_2 ionization is discussed. *Subject Headings:* **1. Oxygen dissociation 2. Ionospheric composition 3. Rocket data.**—*E.K.*

11I–95 551.507.362.1:551.521.17:551.521.326

Byram, E. T.; Chubb, T. A.; Friedman, H. and Kupperian, J. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **Far ultra-violet radiation in the night sky.** (In: **The threshold of space,** ed. by M. Zelikoff. N. Y., Pergamon Press, **1957.** p. 203–210. 5 figs., 5 refs.) **DLC**—Results for a single exploratory rocket flight, which reached a height of almost 105 km, are discussed. The instrumentation, consisting of Lyman α and 1230–1350 Å counters, is described. A tracing of a photographic record is given presenting the first measurement of starlight below 2000 Å. No responses were observed below 87 km. *Subject Headings:* **1. Ultraviolet radiation 2. Night sky radiation 3. Rocket data.**—*A.A.*

11I–96 551.507.362.1:551.508.59:551.557

Cline, Dudley E., **Rocket-beacon wind-sensing system.** *U. S. Signal Engineering Lab., Ft. Monmouth, N. J., Engineering Report,* E-1205, June 14, **1957.** 20 p. 19 graphs, 2 tables, 8 refs., 18 eqs. **DWB** (M08.5 C641ro)—From the spring of 1956 to the summer of 1957 the meteorological branch of the Evans Signal Laboratory, Belmar, N. J., conducted a series of tests based on the theoretical factors involved in the development of a wind-sensing system, utilizing a rocket to carry into the air a beacon-parachute combination. This program aims at obtaining upper wind data. A description of the project is given. The B-P system used is carried to 200,000 ft and released to follow the wind fields from such a height to an altitude of 100,000 ft. (*Same item as* 10.11–110, Nov. 1959, *Met. Abstr.*) *Subject Headings:* **1. Rocket-borne wind instruments 2. Upper air wind measurement techniques.**—*N.N.*

11I–97 551.507.362

de Jager, C. (Observatory Sonnenborgh, Utrecht), **Wetenschappelijk onderzoek van uit raketten en met de kunstmaan.** [Scientific research with rockets and with the artificial satellite.] *De Meteoor,* Utrecht, 13(1/2):2–3, Feb./April **1957.** table. English summary p. 2.—A review is given of scientific research done with the aid of rockets and of the results hitherto acquired. *Subject Headings:* **1. Rockets 2. Satellite observatories.**—*A.V.*

11I–98 550.3:061.3:016 551.507.362:016

†Embrey, Lee Anne, **Bibliography for the International Geophysical Year.** *U. S. National Science Foundation,* [*Publication*] *No. NSF* 57-25, July 1, **1957.** 51 p. **DWB**—The general program of the IGY is summarized, a list of 64 countries and of members of CSAGI and of U. S. Committee and of various panels is presented and a bibliography of 600 items, arranged under a number of specific and a few general headings (such as historical background, organization, overall program, activities of other nations) is included. Most of the articles are of a nontechnical nature. By far the largest section is on **Rockets and Satellites** (about 250 items). A few items are included for each of the 11 special disciplines comprised in IGY. (*Same item as* 9.5–47, May 1958, *Met. Abstr.*) *Subject Headings:* **1. IGY bibliographies 2. Rocket and satellite bibliographies.**—*M.R.*

11I–99 551.507.362.1:629.19

†Gatland, Kenneth W., **The Vanguard Project.** *Spaceflight*, London, 1(1):15–28, Oct. **1956.** 11 figs., 2 tables, 20 refs. Also his: **Rockets and artificial satellites in the IGY.** *Ibid.*, 1(4):130–138, July **1957.** 5 figs., 3 tables, 5 refs. **DLC**—The history of upper air research by means of rockets, characteristics of the rockets involved in such research, and plans of the IGY are reviewed with particular emphasis on the Vanguard Project. Tables of rocket performance characteristics, photographs of rockets and the Vanguard satellite, explanatory diagrams of launching trajectories, and other illustrations are included. *Subject Headings:* **1. Project Vanguard 2. Rocket exploration of upper atmosphere 3. IGY rocket program.**—*G.T.*

11I–100 551.507.362.1:551.515.2

Haas, Herbert W.; Smith, Harold D. and Tatreault, L. E., **The design and performance of the Mytymouse Homing System for the Rocket Photography of Hurricanes Project.** New Mexico. College of Agriculture and Mechanic Arts. Physical Science Lab., Contract N9onr-95302, (Unnumbered Report), Feb. 1, **1957.** 26 p. 22 figs. (incl. photos), 19 refs. **DWB** (621,3843 N532d)—The objective of "The Rocket Photography of Hurricanes Project" is to obtain high altitude photographs of vast weather formations. After the photographic phase of a mission is executed, the instrumented section of the rocket containing the cameras and two homing transmitters is lowered to the surface of the sea and recovered by the most expedient means. One of the homing transmitters is a long range unit called SARAH. The second unit is a medium-to-short range homing transmitter called MYTYMOUSE. The design and performance of the MYTYMOUSE homing system for sea recovery operations is presented in the report. (*Same item as* 9.10–119, Oct. 1958, *Met. Abstr.*) *Subject Headings:* **1. MYTYMOUSE homing system 2. Hurricane rocket photography.**—*Authors' abstract.*

11I–101 551.507.362.1:551.501.7

Izakov, M. N. and Kokin, G. A., **Izmerenie temperatury, davleniia i plotnosti atmosfery s pomoshch'iu raket.** [Rocket measurements of atmospheric temperature, pressure and density.] *U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby. Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, Informatsionnyi Sbornik*, No. 4:57–61, **1957.** 3 figs. **DWB**—The Central Aerological Observatory developed a special meteorological rocket whose head is released at a given altitude and comes down by parachute so that the instruments remain for a longer time in the strata being investigated. The rocket head contains thermal manometers measuring pressure within a range of 10 to 5×10^{-3} mm Hg; membrane manometers measuring pressure from 760 mm to 10 mm Hg, special resistance thermometers and bolometers. The recordings of the instruments are transmitted by radio. The head also contains a camera and the photographs obtained are used to determine the position of the rocket in flight. Various theoretical and experimental problems associated with the measurement of temperature, pressure and density were solved. These include the phenomena resulting from the movement of the instruments in rarefied gas, the inertia of the recording devices, the relationship of the thermal coefficient of restoration of the thermometers and manometers and the Mach and Reynolds numbers, the relationship of the manometer pressure and the Mach number, etc. The pressure and temperature are two interdependent variables since pressure can be computed from temperature obtained by the given thermometers by means of the barometric formula and the equation of state, and temperature can be computed similarly from pressure measured with a manometer. Graphs giving the distribution of temperature with height, pressure with height, and density with height, according to data of the Central Aerological Observatory and U. S. A. data, are presented. (*Same item as* 10.10–156, Oct. 1959, *Met. Abstr.*) *Subject Heading:* **1. Rocket observation techniques.**—*I.L.D.*

11I–102 551.507.362.1

Lear, John, **Miners of the sky.** *Saturday Review*, N. Y., 30(9):42–46, March 2, **1957.** 5 photos. **DLC**—A popular account of the use of Aerobee rockets in upper altitude studies of the atmosphere at the Holloman Air Force Research Center, N. Mex. The author describes in considerable detail the actual launching of an Aerobee rocket and discusses the development of the idea of using rockets for atmospheric research by David R. Bates, K. Natanoke, etc., the use of the rocket to study the presence of nitrogen atoms in the upper atmosphere, the nature of the "air glow," the ozone layer, etc. *Subject Headings:* **1. Aerobee rocket firings 2. Upper atmosphere research.**—*I.L.D.*

11I–103 551.507.362

*†Ley, Willy, **Rockets, missiles and space travel.** Rev. and enl. ed. N. Y., Viking Press, **1957.** 527 p. 85 figs., numerous tables, bibliog. p. 489–520. **DWB** (629.14353 L681r)—A pioneer and well illustrated book on rockets, first published in 1944 and reprinted at times under varying titles (2 complete revisions in 1947 and 1951), giving the history, development and use of rockets up to World War II, during the war (V-2) and after the war, the Peenemünde and White Sands centers

and work there, ideas of satellites and space ships, and an appendix giving useful data on characteristics of various types of rockets, both German and American, on rocket mail, rocket societies and literature published in English, French, German, Italian, Russian, etc. The bibliography is very extensive and the text and drawings include the design of the Vanguard before Sputnik I was launched. (*Same item as* 9.11–37, Nov. 1958, *Met. Abstr.*) *Subject Headings:* **1. Rockets 2. Satellite observatories 3. Space ships.**—*M.R.*

11I–104 551.507.362.1:551.510.53(02)

Link, František and Neužil, Luděk, **Raketové lety a výzkum vysoké atmosféry.** [Rocket flight and exploration of the upper atmosphere.] Prague, Ceskoslovenská Akademie Věd, **1957.** 235 p. 104 figs. (incl. photos), tables, 18 refs. **DLC** (TL782.L5)—As stated in the introduction to this book on the upper atmosphere, the use of rockets greatly facilitates upper atmospheric research but does not replace other methods of exploration. Accordingly, the authors deal with all available methods of investigating the various properties of the upper atmosphere. Upper atmospheric phenomena are discussed on the basis of results reported in international literature and of original work. The methods described include stratosphere flights, acoustical sounding, photometric and other measurement during lunar eclipses (Link contributed considerably to the development of this method), rocket launchings (based upon work in the U. S.), artificial satellites (based upon Project Vanguard), ionospheric sounding, spectroscopy (including rocket spectroscopy), etc. The upper atmospheric phenomena discussed include ozone, twilight phenomena, night sky luminescence, ionospheric phenomena, auroras, meteors, geomagnetism, structure and composition of the atmosphere, etc. The information is up to date and presented in a clear nontechnical manner for the benefit of the general public. (*Same item as* 9.11–9, Nov. 1958, *Met. Abstr.*) *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Upper atmosphere textbooks.**—*G.T.*

11I–105 551.507.362.1

Liu, Vi-Cheng (*Mich. Univ., Ann Arbor*), **On the motion of a projectile in the atmosphere.** *Zeitschrift für angewandte Mathematik und Physik*, Basel, 8(1):76–82, Jan. **1957.** 11 refs., 5+eqs. **DWB, DLC**—The equation of rectilinear motion of a projectile which moves in an atmosphere, of which the density decreases exponentially with the altitude, is solved. It is found that the velocity of the projectile can be expressed explicitly in terms of confluent hypergeometric functions. This theory is applied to treat two specific problems: (1) the flight analysis of a sounding rocket during the free-flight period and (2) the calculation of ambient temperature from the trajectory of a spherical projectile. (*Same item as* 9.4–80, April 1958, *Met. Abstr.*) *Subject Heading:* **1. Rocket rectilinear motion.**—*Author's abstract.*

11I–106 537.563:551.510.53:551.507.362.1

Marmo, F. F.; Pressman, J.; Aschenbrand, L. M.; Jursa, A. S. and Zelikoff, M. (*all, GRD, AF Camb. Res. Ctr., Mass.*), **The formation of an artificial ion cloud: photoionization of NO by solar Lyman alpha at 95 KM.** (In: **The threshold of space,** ed. by M. Zelikoff. N. Y., Pergamon Press, **1957.** p. 232–234. fig.) **DLC**—A quantity of 18½ lbs of NO was released from a rocket at 95 km, anticipating that photoionization would occur, thanks to the Lyman Alpha radiation. Three independent observers detected the existence of a newly formed electron cloud by means of C3 radar. A wind velocity of about 60 m/sec was computed. The phenomenon lasted about 12 min. *Subject Headings:* **1. Artificial ion clouds 2. Photoionization 3. Nitrogen oxide ionization 4. Rocket research.**—*A.A.*

11I–107 551.507.362.1:551.551.5

Mason, Homer P. and Gardner, William N., **A limited correlation of atmospheric sounding data and turbulence experienced by rocket-powered models.** *U. S. National Advisory Committee for Aeronautics, Technical Note*, 3953, April **1957.** 51 p. 38 figs., 19 refs. **DWB, DLC**—Atmospheric turbulence as experienced by rocket-powered models and temperature lapse rate data obtained from rawinsonde soundings have been analyzed and compared in 38 cases by using an assumed lapse rate stability boundary. A limited correlation has been obtained which shows that a large percentage of turbulent conditions can be avoided by making rocket-model flight tests only during marginal or stable lapse rate conditions. (*Same item as* 9.2–162, Feb. 1958, *Met. Abstr.*) *Subject Headings:* **1. Atmospheric turbulence 2. Rocket soundings during stable lapse rate conditions 3. Turbulence avoidance.**—*Authors' abstract.*

11I–108 551.508.4:551.510.53:551.547

Mikhnevich, V. V., **Izmerenie davleniia v verkhneĭ atmosfere.** [Measurement of pressure in the upper atmosphere.] *Uspekhi Fizicheskikh Nauk*, Moscow, 63 (1b):197–204, Sept. **1957.** 8 figs., 2 tables, 5 refs. **DLC.** Transl. into English in corresponding issue of *Soviet Physics USPEKHI*, New York.—The apparatus (using an unstabilized container) and results of pressure measurements

at heights of 50–100 km are discussed. *Subject Headings:* **1. Upper atmosphere pressure measurements 2. Rocket pressure instruments.**—*Physics Abstracts.*

11I–109 551.507.362.1:551.501.7

Newell, Homer E., Jr. (*Naval Res. Lab., Wash., D. C.*), **The high altitude sounding rocket.** *Jet Propulsion*, 27(3):261–262, 288, March **1957.** **DLC**—The essential feature of a sounding rocket is its ability to carry scientific instruments into the upper atmosphere. Because of this, such things as solar radiation, radio frequency waves, the ionosphere, the earth's magnetic field, the composition of the atmosphere, the aurora, cosmic rays, micrometeorites, cosmic dust, atmospheric structure and airglow can be studied from a vantage point above the atmosphere. Because of the absorbing and obscuring effect of the atmosphere many of these observations can be made only from rockets. There are needs for rockets to carry instruments to peak altitudes ranging from 20 to over 200 mi. Payload requirements vary from less than 25 to more than 200 lb depending on the complexity and nature of the experiment to be performed. Operational simplicity, attitude controlability, cleanness, moderate acceleration, recoverability, and reasonable costs are all desirable features for a high altitude sounding vehicle. Rockets currently in use for upper air explorations are: Aerobee, Deacon, Cajun, ASP, Nike-Deacon, Nike-Cajun, Rockoon, Veronique, and Monica. A number of others are under development. (*Same item as* 9.4–81, April 1958, *Met. Abstr.*) *Subject Headings:* **1. Rocket research 2. Rocket development 3. Upper air observation.**—*Author's abstract.*

11I–110 551.507.362.1

Ordway, Frederick I., III, and Wakeford, Ronald C., **1957 research rocket roundup.** *Missiles and Rockets*, Wash., D. C., 2(3):39–48, March **1957.** figs., tables. **DLC**—A perspective of rocket development over the years, from Explorer II balloon ascent days to the present, is shown in a schematic diagram from ground to 300 mi height. The V-2 Viking, WAC Corporal, Aerobee Deacon and Aerobee Hi rockets are described, the number of firings given and resulting knowledge outlined. Finally, the details of rockets being developed—the Iris, Arcon, Terrapin, Rockaire, Rockoon, etc.—specifications of each, the instrumentation for research, IGY plans, a summary of foreign missiles (British, French, Japanese and German) are discussed and illustrated. (*Same item as* 9.6–108, June 1958, *Met. Abstr.*) *Subject Heading:* **1. Rocket development.**—*M.R.*

11I–111 551.506.22:551.557.5:629.13 551.510.534

Pinus, N. Z., **Mezhdunarodnyĭ geofizicheskiĭ god i problemy aviatsii.** (IGY and aviation problems.) *U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby. Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, Informatsionnyĭ Sbornik*, No. 4:44–56, **1957.** 8 figs., 3 tables, 10 refs. **DWB**—Of special importance to aviation is the wind regime at high altitudes, consequently during the IGY special studies will be made of the jet stream. The characteristics of the jet stream, namely the wind velocities, its seasonal behavior and its properties in the temperate, subtropical and tropical latitudes, etc. are discussed with the aid of charts giving a vertical cross section of the atmosphere (Aug. 15, 1943) from Norway to northwest Spain during a jet stream flow; examples of the position of the jet stream in the Northern Hemisphere, horizontal projection of trajectories of balloons released in Japan in January–February 1956, and winter wind velocities at 10 km in the Northern Hemisphere. Present knowledge on the dissociation of oxygen and nitrogen at elevations above 90 km and on the concentration of ozone with elevation in the atmosphere as indicated by rocket studies is summarized. Also existing information on the distribution of atmospheric temperature and density with elevation, and the characteristics of standard atmospheres are discussed. Graphs giving the temperature distribution at various altitudes up to 500 km and of relative density up to 800 km, and a table of the U. S. Standard Atmosphere, are presented. *Subject Headings:* **1. IGY upper atmosphere program 2. Jet stream studies 3. Upper atmosphere research.**—*I.L.D.*

11I–112 551.506.22:551.507.362.1

Poloskov, S. M. and Mirtov, B. A., **The study of the upper atmosphere by means of rockets, at the Academy of Sciences, U.S.S.R.** *British Interplanetary Society, Journal*, 16(2):95–100, April/June **1957.** "Paper presented at the Congrès International des Fusées et Engins Guidés et d'Équipements, Paris, 3–8 Dec. 1956." **DLC**—The Russian rocket program planned for IGY is outlined. It involves study of the atmospheric structure, movements, electrical properties, cosmic and UV rays, micrometeorites and corpuscular rays from the sun at high altitudes. Particulars of the rockets, the ejected instrument containers (parachuted to the ground), the composition of the atmosphere at 80–95 km, pressure at 50–110 km, wind direction and speed at 60–80 km, etc. are given. (*Same item as* 10.3–39, March 1959, *Met. Abstr.*) *Subject Headings:* **1. Soviet IGY rocket program 2. IGY rocket program 3. Upper atmosphere research. I. Dorling, E. B.** (*transl.*).—*M.R.*

11I–113 551.507.362.1(789)

Pressman, Jerome; Aschenbrand, Leonard M.; Marmo, Frederick, F. et al., (*all, G. R. D., AF Camb. Res. Cen., Mass.*), **A synthetic atmospheric chemiluminescence caused by the release of NO at 106 km.** (In: **The threshold of space,** ed. by M. Zelikoff. N. Y., Pergamon Press, **1957.** p. 235–240. fig., 7 refs., 4 eqs.) **DLC**—Nitric oxide gas was released from an Aerobee X 1-A rocket in New Mexico. A photograph shows an intensity of −2 magnitude. Wind direction and speed (100 m/sec) was obtained. A reaction between NO and atomic oxygen which caused chemiluminescence is suspected. *Subject Headings:* **1. Photochemistry of upper atmosphere 2. Upper atmosphere research 3. Upper air wind measurements 4. Chemical cloud release from rockets 5. Holloman AFB, N. Mex. I. Jursa, Adolph S. II. Zelikoff, Murray.**—*A.A.*

11I–114 551.507.362.1

Singer, S. Fred and Lawrence, Arthur L., **Terrapin: an upper atmosphere research vehicle.** *Jet Propulsion*, N. Y., 27(3):281–284, 288, March **1957.** **DLC**—Terrapin is a 220-lb high altitude vehicle consisting of two solid propellant rocket motors. Its low weight and cost together with ease of handling make it a desirable tool for extensive upper air research. The characteristics of the vehicle and of the instrumentation are described in this paper. (*Same item as* 9.4–83, April 1958, *Met. Abstr.*) *Subject Headings:* **1. Terrapin 2. Rocket instrumentation.**—*Authors' abstract.*

11I–115 551.507.362.1

Townsend, John W., Jr. and Slavin, Robert M., **Aerobee-Hi development program.** *Jet Propulsion*, 27(3):263–265, March **1957.** 3 tables. **DLC**—The Aerobee rocket has been extensively used in the past as a vehicle for upper air research. Newer versions of this rocket, especially designed for this type of experimentation will be used in the forthcoming IGY program. One model, designated as the Air Force Aerobee-Hi, will be capable of carrying a 150-lb payload to approximately 150 mi. The other model, designated the Navy Aerobee-Hi, will carry a 150-lb payload to approximately 170 mi. Both rockets are described in detail. (*Same item as* 9.4–85, April 1958, *Met. Anstr.*) *Subject Headings:* **1. Aerobee rockets 2. Rocket development.**—*Authors' abstract.*

11I–116 551.507.362

§Wexler, Harry, **The satellite and meteorology.** *Journal of Astronautics*, N. Y., 4(1):5, 8, **1957.** 8 figs., 4 refs. **DLC**—Actual photographs of storm and of cloud areas obtained over the Southwest from rockets at heights of about 100 mi in 1947 and 1954 are reproduced and discussed along with the synoptic charts for Oct. 5, 1954, the day the unsuspected tropical storms were identified from the rocket photographs. Other advantages of pole-to-pole satellite observations or photographs from heights of 4000 mi—a model of how the Western Hemisphere would look from such a height (shown in black and white on cover of journal), albedo and radiation balance measurements are outlined. (*Same item as* 9.6–69, June 1958, *Met. Abstr.*) *Subject Headings:* **1. Satellite observation 2. Rocket observations 3. Storm photographs.**—*M.R.*

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11I–117 551.510.535:546.33:535.33

Bedinger, J. F.; Manring, E. R. and Ghosh, S. N. (*all, G.R.D., AF CRC, Bedford, Mass.*), **Study of sodium vapor ejected into the upper atmosphere.** *Journal of Geophysical Research*, Wash., D. C., 63(1):19–29, March **1958.** 4 figs., 3 tables, 15 refs., 8 eqs. **DLC**—Two Aerobee rockets were employed to eject relatively large amounts of sodium vapor into the earth's atmosphere. One of the flights occurred during evening twilight and sodium was placed in the sunlit atmosphere from 75 to 110 km. Sodium D line emission (λ5890 A) was observed in the ejected trail above 90 km, and 5890 A is discussed in terms of resonance scattering of solar radiation. Below 90 km, D line radiation was not apparent, and the trail was white in appearance. This requires the formation of aerosols and indicates that sodium is unlikely to remain in the atomic state below 90 km. The second flight occurred at night. Strong D line emission and a persistent trail were observed in terms of chemical processes which have been proposed to explain the sodium airglow. These processes cannot produce the observed brightness of the trail at the high altitudes. Excited atomic nitrogen (N^2D) is proposed as a possible source of the energy. The observed presence of large amounts of energy stored in the earth's atmosphere above 100 km requires revision of some of the proposals regarding the sodium airglow and its origin. (*Same item as* 9.11–162, Nov. 1958, *Met. Abstr.*) *Subject Headings:* **1. Sodium in upper atmosphere 2. Sodium airglow 3. Sodium D line emission.**—*Authors' abstract.*

11I–118 629:19:016 551.507.362:016

†Benton, Mildred, (*comp.*) (*Library Branch, Technical Information Division, N. R. L., Wash., D. C.*), **Literature of space science and exploration.** *U. S. Naval Research Laboratory, Bibliography,*

No. 13, Sept. **1958.** 264 p. **DWB** (016.629 U585li)—Annotated bibliography with author and subject index, comprising 2274 references to literature for the period 1903 to June 1958, on all aspects of rockets and satellites, astronautics, moon stations, etc. (*Same item as* 10.8–75, Aug. 1959, *Met. Abstr.*) *Subject Headings:* **1. Astronautics bibliographies 2. Space science bibliographies.**—*M.R.*

11I–119 551.507.362.1:551.510.53

Chubb, T. A., Byram, E. T., Friedman, H. and Kupperian, J. E. (*U. S. Naval Res. Lab., Wash., D. C.*), **The use of radiation absorption and luminescence in upper air density measurements.** *Annales de Géophysique*, Paris, 14(1):109–116, Jan./March **1958.** 8 figs., 9 refs. **DLC**—Principle of the method and results of rockets sounding effectuated in 1953 and 1955. The experiments forming the basis of this paper involve the use of radiation and luminescence as a means of measuring upper air densities. (*Same item as* 9.10–118, Oct. 1958, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere density measurements 2. Rocket soundings 3. Radiation absorption and luminescence.**—*A.V.*

11I–120 551.506.22:551.507.362.1:551.510.53

Hanessian, John, Jr. and Guttmacher, Ilene, (eds.), **Experimental results of the U. S. Rocket Program for the International Geophysical Year to July 1, 1958. International Geophysical Year, 1957/1958.** *IGY World Data Center A (Rockets and Satellites), IGY Rocket Report Series*, No. 1, July 29, **1958.** 236 p. figs., photos, tables, refs., eqs. **DWB**—This volume was published at the conclusion of the first 12 months of the IGY. It contains a group of papers describing results obtained in connection with the U. S. IGY program in rocketry. The individual papers are as follows:

Newell, Homer E., Jr., **First year of the U. S.-IGY Rocket Program.** p. 1–10. 9 tables.—The article summarizes the results obtained in the following fields: atmospheric pressure, temperature and density, wind, high altitude photography, chemical composition, ion composition, ionospheric electron density, solar radiation, airglow, auroral radiation, auroral particles, rocket astronomy, cosmic rays, geomagnetic field. The observations were made by some 116 upper air sounding rockets which the United States launched during the first 12 months of the IGY.

Townsend, J. W., Jr. (*U. S. Naval Res. Lab.*), **Atmospheric structure above Ft. Churchill.** p. 11–13. 3 figs.—This report covers the observations made in 1956-1957 by three Navy Aerobee-Hi rockets. It was concluded that the density of the high atmosphere in the region near 200 km is under strong solar control and diffusive separation of argon and nitrogen is present in the winter nighttime Arctic atmosphere above Ft. Churchill in the region 110–150 km.

Townsend, J. W., Jr. and Meadows, E. B. (*both, U. S. Naval Res. Lab.*), **Density of the winter nighttime Arctic upper atmosphere 110 to 170 km.** p. 14–25. 7 figs., 6 refs., 5 eqs.—Also in *Annales de Géophysique*, Paris, 14(1):117–130, Jan./March **1958.** The density of the Arctic upper atmosphere during the winter night has been measured over the interval 110 to 170 km by means of a mass spectrometer mounted in an Aerobee-Hi rocket. The rocket, IGY NN3.17 (NRL-48) was fired at 2321 hrs CST on Nov. 20, 1956 at Ft. Churchill, Canada. The primary purpose of the flight was to obtain data on the composition of the upper atmosphere, but due to a fortunate rocket attitude on the ascent of the rocket it has also been possible to determine atmospheric density during the time mass spectra were obtained. The density profile obtained is higher than that found above White Sands in the region 110 to 145 km and lower above this level. (*Same item as* 10.1–147, Jan. 1959, *Met. Abstr.*)

La Gow, H. E.; Horowitz, R. and Ainsworth, J. (*all U. S. Naval Res. Lab.*), **Rocket measurements of the Arctic upper atmosphere.** p. 26–37. 11 figs., 9 refs., eq. Also in *Annales de Géophysique*, Paris, 14(2):131–139, April/June **1958.**—A review is presented of the structure of the Arctic upper atmosphere as measured by rockets in the summers of 1953 and 1954. Tentative results are reported for 2 Aerobee-Hi rockets fired at Ft. Churchill, Canada in the winter of 1956 and the summer of 1957. A comparison of those results shows: 1) at 200 km the summer daytime atmospheric density at 59°N is 2.5 times the winter daytime value and it is 20 times the winter nighttime value. This summer daytime value is 6.5 times the corresponding White Sands value of 1.4×10^{-7} g/m^3 and 2) between 30 and 45 km, density measurements indicate that seasonal and latitude variations are less than 10% while summer pressure measurements show Arctic temperatures and pressures to be significantly higher than White Sands value. This meridional pressure gradient leads to an easterly geostrophic wind in general agreement with anomalous sound and high altitude balloon measurements. (*Same item as* 10.6–39, June 1959, *Met. Abstr.*)

LaGow, H. E.; Horowitz, R. and Ainsworth, J. (*all, U. S. Naval Res. Lab.*), **Arctic atmosphere structure to 250 km.** p. 38–46. 9 figs., 8 refs.—The results of three Aerobee-Hi rocket observations at Ft. Churchill show: 1) The summer densities from 30 to 70 km at 59°N are approximately 5 to 10% higher than the Rocket Panel values for 33°N, 2) the winter densities from 25 to 40 km are 10 to 20% lower than the corresponding summer values at 59°N; thus

they are 5 to 10% lower than the 33°N Rocket Panel values, 3) the daytime atmospheric density at 200 km at 59°N is higher both in the summer and in the winter than the summer value of $1.4 \pm .5 \times 10^{-7}$ g/m³ for 33°N obtained in August, 1951. At 59°N and 200 km altitude the summer value is $6.7 \pm 2 \times 10^{-7}$ g/m³ while the corresponding winter value is $3.6 + 3, -1.5 \times 10^{-7}$ g/m³ and 4) the summer atmospheric pressure at 110 km at 59°N is $(6.5 \pm .8) \times 10^{-5}$ mm Hg and is a factor of 2.5 higher than the corresponding 33°N value. A tentative result from the third flight has been obtained. This winter night flight gives a density value of $1.3 \pm .6 \times 10^{-7}$ g/m³ at 202 km above 59°N.

Jones, L. M.; Fischbach, F. F. and Peterson, J. W. (*all University of Michigan*), **Seasonal and latitude variations in upper-air density.** p. 47–57. 9 figs., table, 11 refs., 2 eqs.—The falling-sphere method for upper-air density has yielded results in 13 flights at various seasons and latitudes. The results at 33°N show little seasonal variation and are in good agreement with the ARDC 1956 atmosphere. A trend of decreasing density at 50 km with increasing latitude was measured. Later flights at 59°N showed that a variation as large as the one with increasing latitude could occur at a single latitude in a four day interval.

Stroud, W. G.; Bandeen, W. R.; Nordberg, W., Bartman, F. L.; Otterman, J. and Titus, P., **Temperatures and winds in the Arctic as obtained by the rocket grenade experiments.** p. 58–79. 14 figs., (incl. photos), 2 tables, 10 refs., eq.—Ten successful Aerobee rockets carrying the Signal Corps—University of Michigan rocket grenade were fixed at Ft. Churchill, 59°N as part of the U. S. IGY program. One hundred and sixty-three values of temperatures and winds between 25 and 94 km have been measured in summer and winter both in daytime and at night using the improved tracking and sound ranging techniques required to make the grenade experiment an all-weather experiment. Compared to the results of 12 firings at White Sands, the temperatures and winds are more sensitive to time variations, the temperatures are considerably lower at 80 km and the winds show the same winter-from-west, summer-from-east pattern of the middle latitudes.

Spencer, N. W.; Boggess, R. L. and Taeusch, D. (*all University of Michigan*), **Pressure, temperature and density to 90 km over Ft. Churchill.** p. 80–90. 8 figs., 5 refs., 9 eqs. The purpose of this paper is to describe experiments that have been carried out by Aerobee and Nike-Cajun rockets employing pressure as the basic data, and the results of some preliminary data reduction that has been accomplished.

Wenzel, E. A.; Loh, L. T.; Nichols, M. H. and Jones, L. M. (*all Univ. of Michigan*), **The measurements of diffusive separation in the upper atmosphere.** p. 91–106. 8 figs., 6 tables, 10 refs. The results of 2 rocket flights in August, 1956 are reported. The observations point strongly toward the presence of diffusively separated air in the 60 to 90 km region over White Sands.

Meadows, E. B. and Townsend, J. W., Jr. (*both U. S. Naval Res. Lab.*), **Diffusive separation in the winter nighttime Arctic upper atmosphere 112 to 150 km.** p. 107–119. 8 figs., 10 refs., 2 eqs. Also in *Annales de Géophysique*, Paris, 14(1):80–93, Jan./March 1958.—The composition of the upper atmosphere between 105 and 241 km has been measured by means of a rocket-borne radio frequency mass spectrometer. The instrument was flown on an Aerobee-Hi rocket IGY NN3.17 (NRL-48) at 2321 hrs CST on Nov. 20, 1956 at Ft. Churchill, Canada. Ninety-six spectra were obtained on the ascent of the rocket and 7 spectra on the descent of the rocket over the range 52 to 6 AMU. From an analysis of these spectra, data have been obtained which show that there was diffusive separation of argon and nitrogen in the region 112 to 150 km. Extrapolation of the data indicates that separation began by about 105 km. Data were also obtained on the general composition of the upper atmosphere over the regions covered in flight. These data show the presence of atomic oxygen. (*Same item as* 10.1–146, Jan. 1959, *Met. Abstr.*)

Johnson, C. Y.; Meadows, E. B. and Holmes, J. C. (*all U. S. Naval Res. Lab.*), **Ion composition of the Arctic ionosphere.** p. 120–122, fig., 5 refs. The experiment of three Aerobee-Hi rockets, launched on Nov. 20, 1956, Feb. 21, 1958 and March 23, 1958 detected the presence of positive and negative ions on all flights. The distribution of the major positive ions above Ft. Churchill, Canada, is shown.

Johnson, C. Y.; Heppner, J. P.; Holmes, J. C. and Meadows, E. B. (*all U. S. Naval Res. Lab.*), **Results obtained with rocket-borne ion spectrometers.** p. 123–130. 8 figs., 8 refs. Aerobee rockets instrumented with spectrometers in nighttime flight to 114 km showed that ions in a sporadic E region over White Sands were primarily N_2^+. The same instrumentation in daytime flight detected only negative ions. The flight to 251 km on Nov. 20, 1956 from Ft. Churchill obtained positive ion spectra in the mass range 6 to 53 AMU for 375 sec while the rocket was above 90 km.

Townsend, J. W., Jr.; Johnson, C. Y.; Holmes, J. C. and Meadows, E. B. (*all U. S. Naval Res. Lab.*), **Atmospheric composition at Arctic high altitudes.** p. 131–139. 5 figs., 8 refs., eq.—By June 1958 3 Aerobee-Hi rockets instrumented with radio-frequency mass spectrometers were launched

at Ft. Churchill, Canada. The results of these flights show that there is diffusive separation of argon and nitrogen in and above the E region of the ionosphere; the principal positive ions are O_2^+, NO^+ and O^+, the principal and possibly only negative ion is NO^-, and the abundance of the positive ions during the daytime changes as altitude increases.

Seddon, J. C. and Jackson, J. E. (*both U. S. Naval Res. Lab.*), **Rocket Arctic ionospheric measurements.** p. 140–148. 7 figs., 6 refs., 2 eqs. Preliminary results are presented of ionospheric research conducted with Aerobee-Hi rockets fired at Ft. Churchill. The electron density profiles are shown for 3 firings; a summer day, a winter day and a winter night. The daytime profiles are quite similar to those measured over New Mexico at 33°N. The one winter night flight showed very little ionization (less than 20,000 el/cc) up to 165 km. Above 190 km spread-F caused the data to be so complex that only qualitative statements can be made. Differential absorption was also measured on the 2 daytime flights during polar blackout conditions. The region between 60 and 70 km accounted for the bulk of the absorption at 7.75 mc. It was possible to compute in the D region the frequency of occurrence of electron collisions with neutral particles with the surprising result that the collisions were a factor of 3 less than has been believed previously.

Seddon, J. C. and Jackson, J. E. (*both U. S. Naval Res. Lab.*), **Ionosphere electron densities and differential absorption.** p. 149–158. 11 figs., 8 refs., eq. A review of daytime ionosphere measurements made over White Sands. The height of the maximum electron density was close to 300 km. The ionosphere was found a continuum rather than a series of layers. The first measurements of electron densities in the Arctic ionosphere were taken at Ft. Churchill during polar blackouts, one flight providing data from 55 to 236 km. It was assumed that charged particles must play an important role in the creation of low-level ionization.

Van Allen, J. A. (*State University of Iowa*), **Rocket measurement of soft radiation.** p. 159–163. 4 figs., table, 2 refs. The author refers to the systematic study of a "soft radiation" discovered by Meredith, Gottlieb and Van Allen (State University of Iowa) since 1953. The article summarizes the maximum observed counting rates of radiation at high altitudes obtained from 22 rockets during the summer of 1953, 1954 and 1955. A similar flight in the southern auroral zone on Nov. 3, 1957 found comparable intensity of soft radiation. Recent flights in the northern auroral zone have confirmed the existence of the soft radiation.

McIlwain, C. E. (*State University of Iowa*), **Direct measurement of radiation associated with visible aurorae.** p. 164–168. 4 figs. Experiment made by a Cajun rocket at Ft. Churchill, on Feb. 21, 1958 detected the presence of electrons and ions during visible aurorae. The results for electron and ion intensities are shown.

Meredith, L. H.; Davis, L. R.; Heppner, J. P. and Berg, O. E. (*all U. S. Naval Res. Lab.*), **Rocket auroral investigations.** p. 169–178. 9 figs., table, 3 refs. The analysis of data obtained from 3 Aerobee-Hi rockets fired at Ft. Churchill Jan. and March 1958 is reported. It was found that at least some high altitude currents are directly related to the presence of aurorae and it was further found that the rays and the diffuse forms which penetrated the auroral luminosity was primarily due to energetic electrons incident on the upper atmosphere. Energetic ions incident on the atmosphere were also detected and their energy spectrum was found variable, in one case having the form $\exp(-E/72$ kev) and in another $(1/E^{1.4})$.

Friedman, H.; Chubb, T. A.; Kupperian, J. E., Jr. and Lindsay, J. C. (*all U. S. Naval Res. Lab.*), **X-ray and ultraviolet emission of solar flares.** p. 179–182. table. The report covers the performance of the operation up to Sept. 26, 1957. Thirteen two-stage rockets were fired on San Nicolas Island, 60 miles off the coast of California in conjunction with the DAN Flare program. The attached Table summarizes some of the features of the firings. New data on solar x-rays have been obtained in flares 1^+, 2, and 3^+ magnitudes. The largest flare produced the shortest wavelength x-ray emission, about 2A. The total x-ray flux varied from about 10^{-3} ergs/cm²/sec for the class 1^+ flare to about 10^{-2} ergs/cm²/sec for the class 2 flare.

Friedman, H.; Chubb, T. A.; Kupperian, J. E., Jr. and Lindsay, J. C., **X-ray emission of solar flares.** p. 183–185. table, ref. The unpredictability and short life of a flare makes it very difficult to obtain rocket measurements of the x-ray and Lyman α radiations. In 1957, as part of the IGY program, data were obtained on Class 1^+, 2 and 3 flares. In each case strong x-ray emission was observed but no evidence for large increases in Lyman α. The x-ray emission below 8A exceeds 0.02 erg/cm²/sec in Class 2 flare. In the Class 3 flare the maximum depth of penetration was 63.5 km. The coronal x-ray emission was assumed to exhibit a short wavelength limit close to 1.4 A.

Kupperian, J. E., Jr., Byram, E. T., Chubb, T. A., Friedman, H. (*all U. S. Nav. Res. Lab.*), **Far ultraviolet radiation in the night sky.** pp. 186–189. Rocket measurements have shown that the entire night sky is aglow with a diffuse Lyman α (1216A) emission amounting to 10^{-2} erg/cm²/sec from the entire hemisphere. The glow was so bright that celestial sources of Lyman α could not be detected through it. At wavelengths near 1300A discrete celestial sources were

observed, which contribute 10^{-4} erg/cm²/sec from the entire sky in the wavelength interval 1225A–1350A. (For abstract from other source *see* 10.10–252, Oct. 1959, *Met. Abstr.*)

Byram, E. T.; Chubb, T. A.; Friedman, H. and Kupperian, J. E., Jr., **Intensity of solar Lyman Alpha and adjacent ultraviolet emission lines.** p. 190–193. 2 tables, 8 refs.—In 1956, a summary was prepared of all the available published measurements of solar Lyman α intensities from a quiet sun. The paper covers the new measurements added to the list during the IGY and presents quantitative data on the adjacent ultraviolet range from 1225A to 1350A. In the solar spectrum between 1050A and 1350 about 94% of the intensity is in the Lyman α line.

Kupperian, J. E., Jr.; Boggess, A., III; Milligan, J. E. and Friedman, H. (*all U. S. Naval Res. Lab.*), **Rocket astronomy in the far ultraviolet.** p. 194–197. 5 figs., 2 refs. Experimental data observed in a rocket flight on March 28, 1957 are discussed. In the wavelength interval from 1225A to 1350A numerous extended sources of gaseous nebulae were mapped out with a resolution of 3°. These sources were characterized by high surface brightness ($>10^{-3}$ erg/cm²/sec/steradian). A more complete discussion of the results of this first experiment will be published in the Astrophysical Journal.

Purcell, J. D.; Boggess, A., III and Tousey, R., **A high resolution ultraviolet spectrogram of the sun.** p. 198–200. 2 figs., ref.—A high resolution echelle spectrograph, flown in an Aerobee rocket on Sept. 17, 1957 produced a solar spectrum showing the contour of the Mg II doublet at 2800A. The emission lines have a half-width of 0.4A. Absorption components corresponding to the Calcium H_3 and K_3 components were observed, displaced approximately 0.05A to long wavelength from the centers of the emission lines.

Kupperian, J. E., Jr. and Friedman, H., **Gamma ray intensities at high altitudes.** p. 201–202. fig., table.—A brief review of a series of rocket experiments conducted in 1956 and 1957 to measure the intensity of primary gamma radiation and the albedo of the atmosphere at high altitudes. Detection was confined to the energy region below 1 mev. A typical energy distribution is shown. Energy distribution appears strongly displaced in lower energies, the total number of events resulting in energy losses remains relatively constant with altitude.

Kupperian, J. E., Jr.; Byram, E. T.; Friedman, H. and Unzicker, A., **Molecular oxygen densities in the mesosphere over Ft. Churchill.** p. 203–207. 2 figs., 10 refs.—(For abstract *see* 11I–162.)

Van Allen, J. A. and Cahill, L. J. (*both State University of Iowa*), **A latitude of cosmic radiation.** p. 208–210. 3 figs., table.—The results obtained from rocket observations of cosmic ray intensities are presented. Flights were made during the summer of 1957 from latitudes 75°N to 72°S. Some of the data obtained are presented. The total intensity above the atmosphere at far southerly latitudes is the same within 5% as that at far northerly latitudes. It is about 4.3 times as great as that near the equator.

Cahill, L. J., **Evidence for ionospheric currents near the geomagnetic equator.** p. 211–216. 6 figs., 6 refs.—The paper gives a brief review of the principle of operation of the magnetometer and the rocket-borne version of the same. Results of equatorial flights detected the structure of the equatorial current system with two distinct layers. The approximate current density in the lower layer is 6 amps/km² and in the upper layer 8 amps/km².

Wyckoff, P. H. (*U. S. Air Force Cambridge Res. Center*), **Air Force rocket program for the IGY.** pp. 217–219.—The paper deals with the studies in 4 areas of upper atmosphere research, conducted by the Ballistic Research Laboratories. The specific studies include: 1) water vapor measurements at high altitudes, 2) measurements of the earth's magnetic field, 3) studies of the earth's horizon from high altitudes, and 4) ionospheric electron densities.

Berning, W. W. (*Ballistic Res. Labs.*), **IGY upper air research at the ballistic research laboratories.** p. 220–235. 13 figs., 2 tables.—The U. S. Air Force will launch, or has already launched, rockets either at Ft. Churchill or in New Mexico during the IGY period to observe: ambient pressure and temperature—falling sphere density measurements—charge density of ionosphere—day airglow—sun-follower spectrograph—Langmuir probe ion density—meteoritic dust. *Subject Headings:* **1. IGY rocket program 2. Upper atmosphere research 3. Rocket astronomy 4. Geophysical measurements 5. Rocket observations 5. Ft. Churchill, Canada 7. White Sands, N. Mex. 8. San Nicolas Island, Cal.**—*E.K.*

11I–121 551.506.7:551.507.362.1:551.510.53

Hansen, W. H. and Fischbach, F. F., **The Exos sounding rocket.** Michigan. University. Research Institute, Contract AF 19(604)-1943, Final Report, Dec. 1958. 47 p. 23 figs., 3 tables. 5 refs. **DWB**—The Exos sounding rocket was developed to fill the needs of upper-air research with an economical vehicle carrying a 40-lb payload to a 300-mile altitude. The report describes the Exos in detail and gives the results of the first two flight tests. The major part of the report is devoted to a manual-type description of the assembly procedures. Part lists and procurement information are included. *Subject Headings:* **1. Sounding rockets 2. Upper atmosphere research.**—*Author's abstract.*

11I–122 551.510.3:551.507.362.2

LaGow, H. E. and Horowitz, R., **Comparison of high-altitude rocket and satellite density measurements.** *Physics of Fluids*, N. Y., 1(6):478–479, Nov./Dec. **1958.** fig., 6 refs. **DWB**—Atmospheric density measurements obtained with rocket-borne ionization gages are compared with U. S. and U.S.S.R. satellite-drag density measurements. There is no significant disagreement between the results obtained by the two methods once atmospheric variations are taken into account. *Subject Headings:* **1. Upper atmosphere densities 2. Rocket ionospheric data 3. Satellite density measurements.**—*Authors' abstract.*

11I–123 551.507.362:551.510.53

Lequeux, James, **Les études géophysiques au moyen des fusées et des satellites.** [Geophysical investigations by means of rockets and satellites.] *La Nature*, Paris, 3273:24–29, Jan. **1958.** 6 figs., table. **DLC**—The author deals with the development of rockets for research purposes. A table indicates the main characteristics of the rockets used in the United States to explore the high atmosphere. Results in various geophysical fields, such as physico-chemical structure of high atmosphere, ionosphere, earth's magnetic field, radiation of the atmosphere, sun's ultraviolet and X radiation, atmospheric ozone and cosmic rays, are reviewed. *Subject Headings:* **1. Rockets 2. Satellites.**—*A.V.*

11I–124 551.507.362

Massey, H. S. W., **Rockets and satellites in scientific research.** *Endeavour*, London, 17(66):85–89, April **1958.** 2 refs., 4 eqs. **DLC**—Usefulness of rockets in obtaining ionospheric and high atmospheric composition, temperature, density, ionization and radiation data; limitations in time aloft which are overcome by use of satellites, a history of sounding rockets, their instrumentation and future prospects, the orbits and some of the results of the first U. S. and Soviet satellites are reviewed for general information. The results of ejection of sodium vapor and of NO at high altitudes (40–60 mi) are also discussed. The fluorescence from the sodium vapor cloud persisted for 20 min, even at points 300 mi away from the launching site. (*Same item as* 10.6–85, June 1959, *Met. Abstr.*) *Subject Headings:* **1. Rocket soundings 2. U. S. satellites 3. Soviet satellites 4. Satellite observations.**—*M.R.*

11I–125 551.510.53(02):551.507.302

Massey, Harrie Stewart Wilson and Boyd, R. L. F., **The upper atmosphere.** London, Hutchinson and Co., **1958.** 333 p. 12 figs., 21 plates, 6 tables, 20 refs., 33 eqs. Price: 63 sh. **DLC** (QC879.M3)—Ch. 3 (p. 49–73), **Research by balloons and rockets,** provides information on the basic principles of rocketry, including rocket motors, function of the motor, first research rockets, motion of rockets, cost of rockets, solid propellants and rockets fired from balloons and two-stage rockets. The basic instrumentation for rockets: power supplies, programming and performance control equipment, safety and monitoring equipment, data recovery equipment, position determination systems and orientation determination systems are discussed. At the end of the chapter there is a summary of rocket-borne experiments, the various types of research and the corresponding instrumentation. Ch. 4 (p. 84–94), **Probing with sound waves,** involves rocket grenade experiments, analysis of rocket grenade data, gravitational separation of atmospheric constituents, sampling and contamination experiments. In Ch. 12 (p. 295–317), **Artificial satellites,** different types of tracking and telemetry and the scientific uses of satellites are described. A list of experiments includes: study of ionospheric structure, meteoric dust, environmental measurements, solar Lyman α radiation, cosmic-ray investigation, ultraviolet radiation, interplanetary matter, meteorological observations, electric and magnetic field. On p. 314 a table shows a comparison of the first satellites (Sputnik I, II, III, Explorer I and III, and Vanguard I). (For abstract on the whole book *see* 10.8–6, Aug. 1959, *Met. Abstr.*) *Subject Headings:* **1. Upper atmosphere textbooks 2. Rockets 3. Satellites.** —*E.K.*

11I–126 551.507.362:551.510.53:551.547:551.510.3

Mikhnevich, V. V., **Predvaritel'nye rezul'taty opredeleniia plotnosti atmosfery vyshe 100 km.** [Preliminary results of the determination of atmospheric density at heights above 100 km.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 2:26–31, **1958.** 5 figs., 2 tables, 9 refs., eq. **DLC**—Transl. into English in **Artificial Earth Satellites,** N. Y., Plenum Press, **1960.** Vol. 2:32–39. **DWB**—With the aid of diagrams the author describes the construction of a thermal ionizing and magnetic manometer for measuring atmospheric density and pressure within the limits of 10^{-5}–10^{-9} mm Hg. In order to diminish light currents from the condenser the latter was made of fine wires. By means of a supplementary circuit between the cathode and anode a self stabilizing emission current is produced. The possible errors in determining atmospheric pressure and density are examined. By means of suitable hermetic sealing and by selection of construction materials having a low vapor pressure, the discharge of gas by the rocket or satellite would exert practically no influence on the

measurement of atmospheric pressure or density if the gas was excluded from coming into contact with the manometer. As a result of dissociation of the air molecules errors arise, since the manometer was calibrated for the ordinary atmosphere. The results of measurements of atmospheric density by rockets and satellites are presented in a graph. The atmospheric density was measured from the pressure by the formula $N = P_1 \sqrt{\frac{1}{2nmk}} \cdot \frac{1}{\sqrt{T_1 v \sin\theta}}$ where P_1 = pressure within the manometer, v = velocity of satellite or rocket, θ = angle between the velocity vector and plane of opening of the manometer, k = Boltzmann constant, m = mass of the molecule. Tables giving atmospheric density as measured by containers in rockets and density measurements obtained by different investigations are presented. The measurements indicate an increase in the height of the uniform atmosphere. The pressure within the manometer depends upon the orientation of the satellite. *Subject Headings:* **1. Upper atmosphere density measurements 2. Rocket data 3. Satellite data 4. Manometers.** —*I.L.D.*

11I–127 551.501.7:551.507.362.1:551.576.1:778.35

Negley, Richard M., **On the use of high-altitude cloud photographs as a basis for inferring the distribution of wind, temperature, pressure, and stability.** Florida. State Univ. Dept. of Meteorology, Contract AF 19(604)-1754, Scientific Report No. 2, Aug. 15, **1958.** 39 p. 16 figs. (incl. photo), 25 refs., 5 eqs.—Some suggestions for analyzing high-altitude cloud photographs from rockets are introduced, and the value of these cloud photographs as a supplement to the usual meteorological observations is discussed. The criteria for analysis are chosen with the aim of relating them qualitatively to such parameters as wind, temperature, pressure, and stability. A method for constructing a grid as an aid in space orientation is presented for use with oblique photographs. A case study, based on a two-photograph composite from the U. S. Navy rocket Viking II, is presented. A grid is constructed for the composite and a cloud analysis is used to infer patterns of wind, temperature, pressure, and stability. Certain qualitative measurements were only partially successful. *Subject Headings:* **1. Upper atmosphere research 2. Rocket photography 3. Viking II.** —*Author's abstract.*

11I–128 551.501.771:551.571.7:551.507.362.1:679.5

Nike-Cajun measures humidity. *Missiles and Rockets*, Wash., D. C., 4(5):14, Aug. 4, **1958.** photo. **DWB, DLC**—A report is given of the measurement of humidity in the upper atmosphere by a hygrometer installed in the nose of the IGY Nike-Cajun High Altitude Carrier Rocket. The operation was carried out with a photosensitive lead sulfide cell. *Subject Headings:* **1. Rocket hygrometers 2. Humidity measurement techniques 3. Nike-Cajun rockets 4. Plastics for rockets.**—*N.N.*

11I–129 551.596.1:551.510.5:551.507.3621

*Otterman, Joseph, **Effect of finite-amplitude propagation in the rocket-grenade experiment for upper-atmosphere temperature and winds.** Michigan. Univ. Engineering Research Institute, Contract DA-36-039 SC-64659, Technical Report (unnumbered), April **1958.** 15 p. 3 figs., 2 tables, 7 refs., 23 eqs. **DWB** (M10.5 M624ef)—This report presents an estimate of the effect of the finite-amplitude propagation on the travel times of pressure waves from the explosions to the ground and a method for taking this effect into account in the data reduction of the rocket grenade experiment for upper atmosphere temperature and winds. (*Same item as* 10G–102, July 1959, *Met. Abstr.*) *Subject Headings:* **1. Acoustical soundings 2. Rocket grenade data.**—*Author's abstract.*

11I–130 551.507.362:551.596.1

Otterman, Joseph, **A simplified method for computing upper-atmosphere temperature and winds in the rocket-grenade experiment.** Michigan. University Engineering Institute, Dept. of Aeronautical Engineering, Contract DA-36-039-SC-64659, Project DA-3-17-02-001, Technical Report (unnumbered), June **1958.** 40 p. 7 figs., 6 tables, foot-refs., numerous eqs. **DWB** (M07.362 O89si)—A much simpler method than that which is used at the present for the calculation of temperatures and winds at high altitudes is presented. The data were obtained from the rocket-grenade experiment conducted by the Engineering Research Institute of the University of Michigan. Aspects of the subject covered are: method of the data reduction, calculation of the characteristic velocities from the times of arrival at the microphones, equations for meteorological parameters in a layer with a known sound-ray path, equations for tracing the sound-ray through a layer with known meteorological parameters, etc. The method is illustrated by applying it to the data from SM 1.01 and SM 1.02 rocket flights. (*Same item as* 10G–120, July 1959, *Met. Abstr.*) *Subject Headings:* **1. Rocket-grenade temperature determination 2. Rocket-grenade wind determination 3. Acoustical soundings 4. Upper air soundings.**—*N.N.*

11I–131 551.547:551.507.362.1

Ripley, William S., **Comparison of Russian and American upper air data at rocket altitudes.** U. S. Air Force Cambridge Research Center, Jan. **1958.** 6 p. 3 figs., 2 tables, 8 refs. Typescript. **DWB** (M10.535 R592co)—Pressure data obtained by means of rockets over central European U.S.S.R. up to an altitude of 100 km are plotted against similar data obtained over the U. S. The two pressure vs. altitude curves cross at 80 km; above that altitude the Russian pressure values are lower and below that altitude higher than the American values. Insufficiency of number of measurements or geographical differences are suggested as probable causes of the discrepancies. (*Same item as* 10.2–239, Feb. 1959, *Met. Abstr.*) *Subject Headings:* **1. Rocket data comparisons 2. Pressure data discrepancies between American and Russian observations.**—*G.T.*

11I–132 551.551:551.510.53:551.507.362.1(985)

Shvidkovskiĭ, E. G., **Nekotorye rezul'taty izmerenii termodinamicheskikh parametrov stratosfery pri pomoshchi meteorologicheskikh raket.** [Some results of measurements of thermodynamic parameters of the stratosphere by meteorological rockets.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 2:10–16, **1958.** 4 figs., ref. **DLC.** Transl. into English in **Artificial Earth Satellites**, N. Y., Plenum Press, **1960.** Vol. 2:12–19. **DWB**—A brief description of the method of measuring temperature and pressure in the upper stratosphere by means of rockets is presented. This is followed by a preliminary discussion of the seasonal variations of the temperature field in the middle and lower stratosphere on the basis of data of rocket studies in the Arctic and middle latitudes of the U.S.S.R. The material included data up to 40–50 km. Graphs showing the vertical distribution of temperature for different months in 1957 and 1958 for Franz Josef Land, at middle latitudes, the annual variation of temperature in the stratosphere and the temperature field over Franz Josef according to given rocket readings are included. The temperature of the lower stratosphere between 20–25 km falls on transition from summer to winter months. In the 40–50 km region this rule is disturbed; the maximum is situated at a higher level in the north than in middle latitudes. An approximately isothermal layer extends into the polar region at a greater height from the troposphere than in middle latitudes. The annual temperature variation of the stratosphere at middle latitudes shows a marked maximum during the summer period in the lower stratosphere. In this region (26–34 km) the annual fluctuation is 13°C. In the 40–50 km region the fluctuation is 10°C. In the latter region the maximum temperature coincides with the summer solstice; in the former it is in July. *Subject Headings:* **1. Upper stratosphere 2. Vertical temperature variations 3. Rocket soundings 4. Franz Josef Land.**—*I.L.D.*

11I–133 551.507.362.1:550.3:061.3:8.03(47)

Shvidkovskiĭ, E. G., **A rocket flies into the stratosphere.** Transl. of original Russian in *Sovetskaia Aviatsiia* [Soviet Aviation], April 13, **1958.** p. 4. Transl. of 3 p. reproduced from typescript, available **DWB** (M07.362 S5622ro). Original not at **DLC**—The Soviet IGY rocket program is described. Rockets are being launched from three bases—one in European U.S.S.R., one near Mirny, Antarctica, and one from the research vessel "Ob." The rockets carry instruments for measuring atmospheric temperature, pressure, density, composition, etc. Some of the instruments are specified and methods of tracking are discussed. Preliminary general results are reported. Two photographs show the launching of a rocket and the other the nose cone with and without its outer shell (these are not included in the translation). *Subject Headings:* **1. U.S.S.R. IGY rocket program 2. Rocket observation techniques 3. Translations 4. U.S.S.R.**—*G.T.*

11I–134 551.501.7:551.507.362.1:551.510.536

Spencer, N. W., **Research in the measurements of ambient pressure, temperature, and density of the upper atmosphere by means of rockets.** Michigan Univ. Engineering Research Institute, Contract AF 19(604)-545, Final Report, June **1958.** 90 p. 20 figs. (incl. photos). **DWB**—The research activities were: (1) development of rocket-borne means for measurements of the ambient pressure, temperature and density of the upper atmosphere and (2) determination of the usefulness and accuracy of the instrumentation developed in order to secure reliable upper air data as above. The system developed and pursued by the research group is based upon the determination of the surface pressures of the nose cone, "impact" or "totai head" pressure of which along with the pressure at one point of the cone wall yields the free-stream Mach number from the ratio of these two pressures. Temperature computation is obtained from knowledge of the velocity of the nose cone taken with the Mach number, and knowing the Mach number one obtains the ambient pressure from the cone wall pressure. The instrumentation of the Aerobees AF 48 and 58 as well as AM2.21 are illustrated in detail and several of the devices of the Nike-Cajun AM6.30 and 6.31 are illustrated and described. Summarization of the several research topics are given as well as graphical and tabular data on some rocket flights. Graphical presentation of thickness of rocket skin vs. temperatures are also given. *Subject Heading:* **1. Rocket instrumentation.**—*W.N.*

11I–135 551.501.7:551.510.53

†Spencer, N. W., **Measurements of atmospheric pressure, temperature, density and composition at very high altitudes.** Michigan. Univ. [Engineering] Research Institute, Contract DA-36-039-sc-78131, Quarterly Report GQ-1, Nov. **1958.** 4 p. 10 refs. Also: Quarterly Report GQ-2, Oct. 1, 1958–Jan. 1, **1959.** 20 p. 6 figs., 14 refs., 38 eqs., Quarterly report GQ-3, Jan. 1–April 1, **1959.** 15 p. 4 figs., 16 refs., 4 eqs. **DWB** (M(051) M624qu)—These are three of a series of reports on a research effort whose objective is the determination of the ambient pressure, temperature, density, and composition of the earth's atmosphere at altitudes above the level where the mean free path of the various particles is appreciably greater than the dimensions of the measuring object. The research effort is devoted to several tasks: (a) a theoretical study of the general measurement problem, and several associated problems; (b) development of suitable sensors; (c) development of associated instrumentation to permit fruitful employment of the sensors; and (d) the development of an ultra-high vacuum system capable of achieving pressures as low as the state of the art permits, with the final objective of sensor calibration and testing. *Subject Headings:* **1. Upper atmosphere research methods 2. Upper atmosphere measurements 3. Exosphere.**—*Author's abstract.*

11I–136 551.508.4:551.507.362.1

Spencer, N. W.; Boggess, R. L.; Brace, L. R. and El-Moslimany, M. A., **A radioactive-ionization-gage pressure-measurement system.** Michigan. Univ. Engineering Research Institute, Contracts AF 19(604)-545, AF 19(604)-1511 and AF 19(604)-1948, Scientific Report, No. ES-1, May **1958.** 61 p. figs., tables, 6 refs. **DWB** (M08.4 M624sc). Also issued in summarized form in its Scientific Report, No. ES-2, Sept. **1958.** 3 p. 8 figs.—An air-pressure-measurement system employing a radioactive ionization gage has been developed for use in rockets for the determination of surface pressures which can be interpreted in terms of the ambient pressure, density, and temperature of the atmosphere. The system has proven useful for the measurement of pressures to at least 10^{-3} mb. Details of apparatus, separate parts and circuits are outlined and illustrated in this report. (*Same item as* 10.5–170, May 1959, *Met. Abstr.*) *Subject Heading:* **1. Rocket pressure instruments.**—*Author's abstract.*

11I–137 551.507.362.1:551.596.1(98)

Stroud, W. G. (*U. S. Army Signal Res. and Develop. Lab., Fort Monmouth, N. J.*), **Meteorological rocket soundings in the Arctic.** *American Geophysical Union, Transactions,* 39(2):789–794, Aug. **1958.** 4 figs., table. **DWB, DLC.** Also in *Jet Propulsion,* N. Y., 28(12):817–822, Dec. **1958.** 9 figs., 3 tables, 16 refs., eqs. **DLC**—Various techniques used by the U. S.-IGY meteorological rocket soundings in the Arctic program are made available in this report. Temperature, pressure, density, and winds have been measured by these new devices. Experiments on the freely-falling sphere, rocket-grenade, gage, aerodynamics and other methods of determining the dynamic processes of the upper atmosphere are discussed. The results achieved so far have been compared with the U.S.S.R. ventures along similar lines. (*Same item as* 10G–104, July 1959, *Met. Abstr.*) *Subject Headings:* **1. Acoustical soundings 2. Rocket grenade experiments 3. Rocket soundings in Arctic.**—*N.N.*

11I–138 551.507.362.1:551.510.53:016

†Townsend, J. W., Jr.; Friedman, H. and Tousey, R., **History of the Upper-Air Rocket-Research Program at the Naval Research Laboratory, 1946–1957.** *U. S. Naval Research Laboratory, NRL Report* 5087, Feb. 21, **1958.** 47 p. 13 figs., over 300 refs. **DWB** (M11 U58u). Review in *Nature,* London, 182(4633):431, Aug. 16, **1958.**—A review of the basic research program of the Naval Research Laboratory since 1946 when it undertook to study the physics of the upper atmosphere (above 100,000 ft) by means of high altitude sounding rockets. The work on pressure, temperature, density and winds, on gas and ion composition, on solar radiation by optical spectrograph and by photo counting techniques, on electron density in the ionosphere, on airglow, cosmic radiation, auroral particles, meteors, geomagnetic field, earth photography and conductivity and application of the data obtained from 104 rocket soundings, along with a bibliography on each of the above subject fields (made up of over 300 reports and papers of NRL scientists), is included in this illustrated report. *Subject Headings:* **1. Rocket research programs 2. Upper atmosphere bibliographies 3. U. S. Naval Research Laboratory upper atmosphere research program.**—*M.R.*

11I–139 551.507.362.1:551.506.22:551.506.7

Wyckoff, P. H., **Rocket as a research vehicle.** *American Geophysical Union, Geophysical Monograph,* No. 2:102–107, **1958.** 3 figs. **DLC.** Also in *Shell Aviation News,* London, No. 233: 2–4, Nov. **1957.**—The essential properties of the Rockoon, Nike-Cajun and Aerobee rockets to be used during the IGY are summarized and the methods of measuring, by means of the rockets, atmospheric temperature and pressure, density and location of the ionized layers, the intensity and wave length of solar radiation in the ultraviolet and soft X-ray portion of the spectrum and of the

magnetic fields in the high upper atmosphere, are described. Photographs of a seven-inch sphere ejected from a rocket to measure density of the upper atmosphere, of a diaxial pointing control which maintains automatically the entrance slit of an ultraviolet spectrograph pointed at the sun regardless of the altitude or roll of the rocket; and of a solar spectrum recorded at an altitude of 112 km, are presented. *Subject Headings:* **1. IGY rocket program 2. Rocket observation techniques 3. Upper atmosphere research.**—*I.L.D.*

11I–140 551.510.41:546.17

Zelikoff, Murray; Marmo, Frederick F. and Pressman, Jerome et al. (*all, GRD, AF Camb. Res. Ctr., Bedford, Mass.*), **An attempt to measure nitrogen by rocket release of ethylene at 105 and 143 KM.** *Journal of Geophysical Research*, Wash., D. C., 63(1):31–37, March **1958.** 3 tables, 13 refs., 2 eqs. **DLC**—Ethylene gas was released from a rocket at 105 and 143 km in an attempt to detect atomic nitrogen in the upper atmosphere. The artificial chemiluminescence produced by the gas clouds was observed from the ground and recorded on Super-Schmidt meteor cameras, using red-sensitive and blue-sensitive photographic plates. The color and intensity of each image can be related to the predominant chemical reaction producing the luminescence. The observations indicate that the lower cloud was caused by the reaction of ethylene and atomic nitrogen, and the upper cloud was caused by the reaction of ethylene with atomic oxygen. (*Same item as* 9.11–148, Nov. 1958, *Met. Abstr.*) *Subject Headings:* **1. Nitrogen measurements 2. Atomic nitrogen in upper atmosphere 3. Rocket observations. I. Manring, Edward R. II. Aschenbrand, Leonard M. III. Jursa, Adolph S.**—*Authors' abstract.*

1959

11I–141 551.507.362.1:535.24:551.521.17

Aboud, A.; Behring, W. E. and Rense, W. A. (*all, Physics Dept., Univ. of Colorado*), **Emission-line intensities in the solar ultraviolet.** *Astrophysical Journal*, Chicago, 130(2):381–383, Sept. **1959.** table, 4 refs. **DWB, DLC**—Intensities of 24 solar ultraviolet emission lines in the range 1206–1817 A were computed from a photometric analysis of rocket spectrograms obtained on Aug. 6, 1957. HLα (1215.7 A) and two lines of SiII (1808.0 and 1816.9 A) were the most intense, measuring 3.43, 1.05, and 1.65 ergs/cm^2/sec, respectively, at heights between 130 and 150 km. The HeII line at 1215.1 A appears to be present on the wing of HLα. The half-width of HLα was fixed at between 0.7 and 0.8 A. Ultraviolet continuum intensities were estimated at two wave lengths. *Subject Headings:* **1. Rocket spectrograph observations 2. Ultraviolet radiation.**—*Authors' abstract.*

11I–142 551.507.362.1:550.3:061.3:551.510.535 629.19(08)

American Astronautical Society, **Advances in astronautical sciences: Proceedings of the 5th annual meeting of the AAS, Nov. 1958 (i.e. Dec. 27–31, 1958), Wash., D. C.** N. Y., Plenum Press, **1959.** 460 p. figs., tables, refs., eqs. **DWB** (629.1388 A512pro), **DLC** (QB1.A26)—A group of 40 papers on various aspects of astronautics read at the Fifth Annual Meeting, Dec. 27–31, 1958 in Wash., D. C., are presented, grouped under 6 major headings: I) Upper atmosphere research; II) Space vehicle design; III) Guidance and instrumentation; IV) Satellite mechanics; V) Rocket and satellite astronomy and exploration of upper atmosphere; VI) Man's environment in space. Papers of interest to meteorologists are:

Goldberg, P. A., **Some aspects of the electrical properties of the upper atmosphere.** p. 37–50. 8 figs., 3 tables, 14 refs., eqs. (For abstract, *see* 11F–51, June 1960, *Met. Abstr.*)

Friedman, H. and Malcolm, Ross, **Rocket astronomy.** p. 388–392. 5 photos. (For abstract, *see* 11.5–175, May 1960, *Met. Abstr.*)

†Van Allen, James A. (*State Univ. of Iowa*), **Corpuscular radiation around the earth.** p. 329–334. 58 refs. "Bibliography of works in the field of trapped radiation, of references from books, regular journals or in reports available on request."—Bibliography deals with auroral, solar, cosmic ray, geomagnetic, solar stream, X-ray, rocket, satellite and recent trapped radiation investigations both in U. S. and in the U.S.S.R. from 1940–1959.

Singer, S. Fred (*Physics Dept., Univ. of Md.*), **Artificial modification of the earth's radiation belt.** p. 335–354. 7 figs., table, 30 refs., eqs. Also issued in *Journal of the Astronautical Sciences*, N. Y., 6(1):1–10, **1959.** 7 figs., etc.—An experiment is suggested for injecting artificially accelerated particles into the "radiation belt" region by means of an electron accelerator carried aloft in a rocket or satellite. The experiment would provide precise data for the study of the mechanism of trapping of solar corpuscular and cosmic radiation in the earth's magnetic field and would eventually help predict phenomena connected with such trapping. Details of the proposed project are discussed and its immediate feasibility is made clear. The total equipment would weigh around 500 lbs.

Townsend, John W., Jr. (*Natl. Aeronautics & Space Admin., Wash., D. C.*), **Rocket exploration of the high atmosphere for the IGY.** p. 385–387.—A brief summary of the conditions and general

results of 210 rocket soundings made by the U. S. during IGY from sites such as Fort Churchill, Canada (95 firings), in the Pacific (NRL) where 21 were launched from San Nicolas Island off California, 10 from a ship off San Diego, 8 from Danger Island during eclipse of 1958, and 3 from or near Guam (U. S. Army R & D) plus 9 at White Sands, 36 in Antarctica. Diurnal, seasonal and latitudinal studies are being made from these coordinated attempts to learn more about the ionosphere, auroras, solar radiation, upper atmospheric physics, cosmic rays, etc. *Subject Headings:* **1. Astronautical sciences 2. IGY rocket program 3. Van Allen radiation belt 4. Upper atmosphere research.**—*E.K.* Ⓢ

11I–143 551.507.362.1:551.510.53(917.1)

†Bandeen, W. R.; Griffith, R. M.; Nordberg, W. et al., **Measurement of temperatures, densities, pressures and winds over Ft. Churchill, Canada, by means of the rocket grenade experiment.** *U. S. Signal Research and Development Laboratory, Ft. Monmouth, Technical Report*, 2076, Nov. 2, **1959.** 71 p. 24 figs., tables, 13 refs., eqs. **DWB** (M(055) U585us)—Ten successful Aerobee rocket firings carrying the Signal Corps-University of Michigan rocket-grenade experiment have been conducted at Ft. Churchill, Manitoba, Canada (59°N) as part of the U. S. IGY program. One hundred and fifty-three values of temperatures and winds between 25 and 95 km have been measured in summer and winter, both during the day and at night, using the improved tracking and sound-ranging techniques required to make the grenade experiment an all-weather experiment. Some striking new facts about the Arctic upper atmosphere were revealed. Temps. in winter are unexpectedly high above 60 km with a second temp. maximum occurring between 70 to 80 km. Summer temps. as low as 165°K at 80 km were recorded. The temp. maximum lies at about 50 km and in summer is greater than in White Sands, while in winter these temps. are lower. Densities and pressures have also been calculated from these data. The winds show a pattern similar to that in the middle latitudes; strong and westerly in winter, weaker and easterly in summer. *Subject Headings:* **1. Aerobee rocket firings 2. Upper atmosphere measurements 3. Ft. Churchill, Canada. I. Stroud, W. G.**—*Authors' abstract.* Ⓢ

11I–144 551.507.362.1:77

Baumann, R. C. and Winkler, L. (*both, Rocket Devel. Branch, Atmos. and Astrophys Div.*), **Photography from the Viking 12 rocket at altitudes ranging up to 143.5 miles.** *U. S. Naval Research Laboratory, NRL Report 5273; Rocket Research Report*, No. 21, April 22, **1959.** 7 p. 14 photos. **DWB** (M07.362 U584r)—On Feb. 4, 1955, Viking 12 was launched at White Sands Proving Ground, N. Mex. The research equipment in the rocket included an aircraft camera which took 53 pictures at altitudes varying from 97.7 mi on the ascent, through the peak of 143.5 mi., to 87.6 mi on the descending portion of the trajectory. Excellent definition was obtained on all of the photographs. The photographs cover the area of the U. S. and Mexico to the west of WSPG. The curvature of the earth, the atmospheric layer, rivers, lakes, railroads, the Gulf of California, Lower California, the Pacific Ocean, clouds, snow-covered mountain peaks, and "smog" over Los Angeles are some of the easily distinguishable features on the photographs. Matching maps have been drawn for some of the photos to permit ready identification of pertinent geographical features. (*Same item as* 11.2–139, Feb. 1960, *Met. Abstr.*) *Subject Heading:* **1. Rocket photography.**—*Authors' abstract.*

11I–145 551.507.362.1:551.508.92:551.521.31

Biriukova, L. A., **Opyt opredeleniia iarkosti neba do vysoty 60 km.** [Experimental determination of the sky brightness at altitudes up to 60 km.] *Moscow. Tsentral'naia Aerologicheskaia Observatoriia, Trudy*, No. 25:77–84, **1959.** 6 figs., 11 refs., 3 eqs. **DLC**—Studies of the sky brightness by different investigators are briefly reviewed for comparison with the results obtained by the author with electric photometers and stereophoto cameras installed in meteorological rockets. The apparatus and methods of recording sky brightness or densities of sky darkness are described in details with analysis of the pictures taken for the zenith and non-zenith areas. Absolute and relative brightness of sky at noon is analytically formulated and changes in intensities computed and plotted on the charts. The results of this experimental study must be considered only as preliminary and for orientation. *Subject Headings:* **1. Rocket instrumentation 2. Photometers 3. Sky brightness measurements.**—*N.P.S.*

11I–146 551.501.7:551.507.362.1:551.510.536:551.510.3:551.557

Blamont, Jacques-Emile, **Nuages artificiels de sodium: vitesse du vent, turbulence et densité de la haute atmosphère.** [Artificial sodium clouds: wind speed, turbulence and density of the upper atmosphere.] *Académie des Sciences, Paris, Comptes Rendus*, 249(14):1248–1250, Oct. 5, **1959.** 3 figs., 3 refs. **DWB, DLC**—Two experiments for projecting sodium into the atmosphere by means of Veronica rockets have been made in Algeria. The first rocket reached an altitude of 127 km, the other 180 km. Author determines speed of wind and density by observing, through stereoscopic photogrammetry, the deformations of the cloud with time. Temperature and reactivity with sodium are determined through interferometric measurements. Successive photos show that the width

of the trail increases with time, owing to the diffusion of the sodium atoms in the atmosphere. This diffusion occurs faster as atmospheric density is smaller. Investigating the width of the cloud helps determine the diffusion coefficient D of sodium and, consequently, the density. The principle of these experiments is clearly stated. *Subject Headings:* **1. Upper atmospheric density measurement 2. Upper air wind measurements 3. Artificial sodium clouds 4. Rockets 5. Algeria.**—*A.V.* Ⓢ

11I–147 551.510.3:551.507.362

†Champion, K. W. (*Physics Dept., Tufts Univ.*) and Minzner, R. A. (*Geophysics Corps., Boston*), **Atmospheric densities from satellites and rocket observation.** *Planetary and Space Science*, N. Y., 1(4):259–264, Sept. **1959.** 2 figs., 21 refs. **DWB, DLC**—Atmospheric densities deduced from high altitude rocket flights have a large variability of which a large percentage is undoubtedly due to measurement errors. Prior to the IGY, the available density data gave reasonable support to the ARDC Model Atmosphere. Satellite data which at first appeared to be inconsistent with rocket data are now seen to be continuous with the average of presently available rocket derived densities. The current data suggest the revision of the 1956 ARDC Model to lower densities near 100 km altitude and demand higher densities above 160 km (a twenty fold increase at 500 km). The revised altitude distribution of density implies (1) lower temperatures at 90 km and (2) temperature-altitude gradients between 105 and 160 km (two times the molecular-scale-temperature gradient of the 1956 ARDC Model). Density-altitude and temperature-altitude profiles for a revised model atmosphere are discussed. *Subject Headings:* **1. Atmosphere-density measurement 2. Rocket observations 3. Satellite observations.**—*Author's abstract.* Ⓢ

11I–148 551.521.17

Colorado. Univ. Dept. of Physics, **Solar ultraviolet research.** Contract AF 19(604)-2181, Final Report, Jan. 1, 1957–Dec. 31, **1959.** 6 p. **DWB** (M(051) C719)—The report covers solar ultraviolet research work done during the period Jan. 1, 1957 to Dec. 31, **1959.** During the flight of Aug. 6, 1957 absolute and relative intensities of emission lines between 1000 and 1900 A were measured, the quality of the solar spectrograms in the range 2300–1800 A was especially good, auto-ionization lines of aluminum were discovered. The flights of June 4, 1958 and March 30, 1959 yielded spectrograms showing at least 150 emission lines between 1216 A and 84 A, the absolute intensity of the 303.8 A He II resonance line at 200 km was found to be of the order of that HLα outside the atmosphere. The experiments were carried out by solar ultraviolet spectrographs flown in Aerobee rockets. The theoretical work included the study of the cause of the ionization in the F layer. The problems of instrument design are discussed. *Subject Headings:* **1. Aerobee observations 2. Ultraviolet intensities. I. Rense, William A.**—*E.K.* Ⓢ

11I–149 551.507.362.1

*Dorling, E. B., **The first six Skylark firings.** *Farnborough, England. Royal Aircraft Establishment, Technical Note*, No. G.W. 530, Oct. **1959.** 69 p. 47 figs., 30 tables, 14 refs. **DAWS**—The Skylark high-altitude rocket, designed to carry payloads of 100–150 lbs to heights up to 100 mi, was successfully proved in 6 test firings at Woomera (Australia) between Feb. 1957 and May 1958. Design, instrumentation, and performance are described in detail. Peak altitudes ranged from 40,000 to 500,000 ft. Scientific tests included grenade and window experiments and airglow measurements. Of special interest to meteorologists are temperature and wind profiles to a height of 70 km for Skylark 04, 13 Nov. 57 (provisional data provided by G. V. Groves, of University College, London, based on the grenade experiment), and winds at 3 levels up to 171,000 ft (data provided by P. A. Sheppard, Imperial College, based on the window experiment). Details of the research program proper, which involved 6 additional firings during 1958, are given briefly in a table showing dates, peak altitudes, and experiments conducted. *Subject Headings:* **1. Skylark high altitude rocket 2. Rocket observation.**—*R. S. Quiroz.*

11I–150 551.557:551.501.7

Elford, W. G. (*Dept. of Physics, Univ. of Adelaide*), **Winds in the upper atmosphere.** *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):132–136, Sept. **1959.** 4 figs., table, 3 refs. **DLC**—A systematic investigation of winds from the results of balloons, rockets and meteors between 75 and 105 km above the ground from Oct. 1952 to Oct. 1954 is presented and illustrated, giving the east-west and north-south components for each month in a table, and the annual variations of periodic winds and the prevailing components together with meteor results in illustrations. "It is now possible to describe the general circulation in medium latitudes up to a height of about 100 km. In summer and winter, large wind gradients exist in the east-west direction. Below a height of 90 km the two periodic wind components are of comparable amplitude and are tidal in nature. The phase of the 24 hr component is approximately independent of height and season, whereas the phase of the 12 hr component varies annually and advances with height during the equinoctial months." *Subject Headings:* **1. Upper air wind analysis 2. Balloon flight observations 3. Rocket observations 4. Meteor observation of upper atmosphere.**—*O.T.* Ⓢ

11I–151 551.510.5:551.507.362

Harris, I. and Jastrow, R. (*both, Nucleonics Div., U. S. Naval Res. Lab., Wash., D. C.*). **An interim atmosphere derived from rocket and satellite data.** *Planetary and Space Science*, N. Y., London, 1(1):20–26, Jan. **1959.** 7 figs., 5 tables, 14 refs., 4 eqs. **DLC**—The analysis of radio tracking data obtained from the U. S. and U.S.S.R. satellites provides information on the density and temperature of the atmosphere at high altitudes. By combining this information with data recently obtained from rocket flights below 200 km it is possible to construct a model atmosphere which yields a determination of density up to 400 km. Above 200 km this atmosphere indicates values of temperature and density which are substantially greater than those predicted in recent extrapolations to these altitudes. They are, however, relatively close to the results of the earlier analysis by GRIMMINGER. The model describes atmospheric conditions at temperate latitudes. Adiabatic equations for the orbit elements are presented to express the relation between perigee density and the rate of change of period. The description of the model atmosphere constructed by combining the rocket data with the density data furnished by Alpha 2—is followed by the analysis of 1958 Alpha (Explorer 1) and 1958 Beta (Vanguard I) data. *Subject Headings:* **1. Atmospheric models 2. Satellite data 3. Rocket data.**—*E.K.* Ⓢ

11I–152 551.506.22:551.507.362.1

*Hart, Pembroke J. and Guttmacher, Ilene (*comps.*), **Flight summaries for the U. S. rocketry program for the International Geophysical Year, Pt. 1, July 5, 1956–June 30, 1958.** *International Geophysical Year*, 1957/1958. *IGY World Data Center A: Rockets and satellites, IGY Rocket Report Series*, No. 2, March 1, **1959.** 193 p. Also: **Pt. 2, May 23–Dec. 31, 1958.** *Ibid.*, No. 3, Sept. 30, **1959.** 129 p. "Flight summaries for 20 pre-IGY rockets not included in Pt. 1 and for 5 rockets planned as part of the IGY program but postponed to 1959 are included in Pt. 2." **DWB** (M07.3621 1612ro)—Preliminary results and comments on the performance of the 127 rocket firings in the eight U. S. rocketry and satellite programs are presented. It gives a description of each flight objective, the rocket-borne equipment and the ground based equipment as well as the upper air instrumentation for each. The basic objectives for almost all of them has been to measure the intensity of radiation during solar flares, to study the Arctic ionospheric structure at a time near solar solstice, to measure temperature and winds, upper air pressures and densities of atmosphere at certain altitudes, to investigate the total cosmic ray intensity through and above the atmosphere at northern latitudes during period of maximum sunspot activity, the correlation of fluctuations of cosmic ray intensity with solar and magnetic data from ground stations, with cosmic ray data in balloon flights at different stations and to investigate the physical nature, energy, intensity and latitude distribution of "auroral soft-radiation." The second report gives details of the remaining 99 rocket firings, including 22 fired during the 1957 period and 5 scheduled during IGY but postponed until 1959. *Subject Headings:* **1. Rocket flights 2. IGY rocket program.**—*N.N.* Ⓢ

11I–153 551.510.53:551.507.362.1:551.510.3:551.547(712.7)

Horowitz, R.; LaGow, H. E. and Giuliani, J. F. (*all, Natl. Aeronautics and Space Admin., Wash., D. C.*), **Fall-day auroral-zone atmospheric structure measurements from 100 to 188 km.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2287–2295, Dec. **1959.** 7 figs., table, 8 refs., 2 eqs. **DLC**—The density and pressure of the atmosphere from 100 to 188 km above Fort Churchill, Manitoba, were determined from the IGY NN 3.15 Aerobee-Hi rocket flight on Oct. 31, 1958, at 2:00 p.m., C.S.T. Two magnetic cold-cathode ionization gages were used to measure pressure and pressure changes on the side of the rolling rocket. Excellent agreement was obtained (a) between the two gages throughout flight, and (b) between ascent and descent measurements. Measured pressures in the region from 100 to 112.5 km were corrected for a residual gas pressure of approximately 3×10^{-5} mm Hg. An ambient pressure of 10^{-4} mm Hg was obtained at 106 km. The derived pressure of 2.3×10^{-6} mm Hg at 188 km is approximately a factor of 2 lower than the corresponding Arctic summer-day value. Densities were measured from 130 to 188 km. The density value of 5.2×10^{-7} g/m^3 at 188 km is approximately 40% lower than the summer-day value. The density profile presented here is in good agreement with the Arctic November-day density point obtained at 200 km in 1956. Scale heights (RT/Mg) were derived from the measured pressure and density data vs. altitude, using the hydrostatic equation. The scale-height value obtained at 188 km was 63 km, and the scale-height gradient from 180 to 188 km was 0.5 km/km. *Subject Headings:* **1. Upper atmosphere structure 2. Aerobee Hi rocket observations 3. Auroral zone atmospheric structure 4. Fort Churchill, Manitoba.**—*Authors' abstract.* Ⓢ

11I–154 550.3:551.506.22

International Geophysical Year, 1957/1958. U. S. National Committee for the IGY, **United States Program for International Geophysical Cooperation—1959.** *IGY 1957/1958. IGY World Data Center A (National Academy of Sciences, Wash., D. C.), IGY General Report Series*, No. 6, Sept. 15, **1959.** 69 p. tables. **DWB** (551 R982an)—It was decided at the 5th General Assembly

of CSAGI (Moscow, July 30, Aug. 9, 1958) to continue IGY programs during 1959. The name "International Geophysical Cooperation 1959" is suggested for this period. The present report is a summary of the U. S.-I.G.C. program. It consists of the projects already established for Antarctic and space research and of those which would assure the continuing operation of IGY World Data Center A. With respect to space and Antarctic research the U. S. submitted program reports to the respective international committees, COSPAR and SCAR. These are presented as Appendix I and II. The programs which are discussed in this report as connected with World Data Center A pertain to following fields: 1) Airglow and ionosphere; 2) Aurora (instrumental and visual); 3) Cosmic rays; 4) Gravity and seismology; 5) Glaciology; 6) Longitudes and latitudes; 7) Meteorology and nuclear radiation; 8) Oceanography; 9) Rockets and satellites; 10) Solar activity. *Subject Headings:* **1. IGY program 2. International Geophysical Cooperation 1959. I. Ruttenberg, Stanley** (*ed.*). —*I.S.* Ⓢ

11I–155 551.507.362.1:551.506.7:551.521.1

†Ivanov-Kholodnyĭ, G. S., **O raketnykh issledovaniiakh korotkovolnovoĭ radiatsii Solntsa.** [Rocket studies of the short-wave radiation of the sun.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofizich,* No. 1:108–121, Jan. **1959.** fig., 4 tables, 79 refs. **DLC.** Transl. into English in the corresponding issue of the English language ed. of the **Izvestiia,** *Bulletin of the Academy of Sciences of the USSR, Geophysics Series.* **DWB**—On the basis of data on the short wave radiation of the sun obtained with rockets during the IGY 1957–1958, the author discusses the following, viz: the solar constant and the distribution of energy in spectrum region of 200–700 Å; the spectrum region 2000–3000 Å, and the radiation line MgII, photography of the spectrum region 1000–2000 Å; energy distribution in the spectrum region $\lambda < 1500$ Å; X-ray radiation energy of the sun; short wave radiation of chromosphere flares, and discovery of ultraviolet radiation of non-solar origin. Data are presented on the spectral distribution of the energy of solar radiation; lines of radiation on the ultraviolet region of 1000–2000 Å spectrum; X-ray radiation of the sun measured by photo counters, etc. *Subject Headings:* **1. Rocket radiation data 2. Short wave radiation 3. X-ray radiation.** —*I.L.D.* Ⓢ

11I–156 551.501.75:551.557

Jenkins, Kenneth R. and Webb, Willis L. (*both, White Sands Missile Range, N. Mex.*), **High-altitude wind measurements.** *Journal of Meteorology,* Boston, 16(5):511–515, Oct. **1959.** 6 figs., 5 refs. **DWB, DLC**—The performance of the Loki wind-sensing rocket system is discussed. Altitudes in excess of those obtainable by standard sounding-balloon techniques were sampled in a series of ten Phase I Loki rockets fired at White Sands Missile Range, N. Mex. Wind measurements obtained by chaff and parachute sensors are presented for high altitudes while the measurements for the lower altitudes were determined by the rawinsonde technique. It is concluded that the Loki wind-measuring system offers a significant advance in the development of an operational meteorological sounding rocket. (*Same item as* 11.4–190, April 1960, *Met. Abstr.*) *Subject Headings:* **1. Upper air wind measurement techniques 2. Loki wind-sensing rocket system 3. Rocket measurement of wind.**—*Authors' abstract.* Ⓢ

11I–157 551.510.3:551.524.7:551.507.362.1(712.7)

Jones, L. M.; Peterson, J. W.; Schaefer, E. J. et al. (*all, Dept. of Aeronautical and Astronautical Eng., Univ. of Michigan*), **Upper-air density and temperature: some variations and an abrupt warming in the mesosphere.** *Journal of Geophysical Research,* Wash., D. C., 64(12):2331–2340, Dec. **1959.** 6 figs., 18 refs., 2 eqs. **DLC**—Measurements of upper air densities and temperatures from 12 flights of the rocket-borne falling sphere are presented. They show little seasonal variation at 32° and 38°N, but large variations in a few winter days at 59°N. A low Arctic density at 60 km results in a linear latitude density gradient of about 2 per cent per degree of latitude. Such a gradient was measured in a latitude survey. An abrupt warming at 45 km was detected at Fort Churchill in January 1958 and related to a warming of larger scope detected by balloons. The average air temperatures above Fort Churchill from January to March are warmer at 75 km and cooler from 50 to 30 km than at 32° to 38°N. *Subject Headings:* **1. Upper atmosphere research 2. Falling sphere method 3. Rocket soundings 4. Ft. Churchill, Canada. I. Schulte, H. F.**—*Authors' abstract.* Ⓢ

11I–158 551.507.362.1:551.510.53:551.510.41

†Jursa, A. S.; Tanaka, Y. et al. (*all, GRD Res. and Dev. Command, Bedford, Mass.*), **Nitric oxide and molecular oxygen in the earth's upper atmosphere.** *Planetary and Space Science,* N. Y., 1(3): 161–172, Aug. **1959.** 6 figs., foot-refs., 2 tables, 24 refs. **DWB**—As a result of a rocket-borne experiment performed in New Mexico on 18 March 1958 at sunset, data were obtained which led to conclusions concerning the concentrations of nitric oxide and molecular oxygen in the altitude range 60 to 87 km. The technique used was that of absorption spectroscopy. A specially designed spectrograph, mounted in a biaxial pointing control, was flown in an Aerobee Rocket. Seven

spectrograms were obtained. It was determined that the concentration of nitric oxide in the altitude interval 63 to 87 km cannot exceed 10^8 molecules/cm^3. The molecular oxygen concentration in the same region was found to be essentially the same as derived from the assumption that the composition of the atmosphere, below 90 km does not change with height. A comment is made concerning the solar continuum and solar Lyman α radiation. *Subject Headings:* **1. Rocket spectrograph observations 2. Aerobee rockets 3. Chemical composition of the upper atmosphere. I. LeBlanc, F.**—*Authors' abstract.* Ⓢ

11I–159 551.510.5:551.513.1

Kallmann, H. Korf (*Rand Corp., Calif.*), **A preliminary model atmosphere based on rocket and satellite data.** *Journal of Geophysical Research*, Wash., D. C., 64(6):615–623, June **1959.** 5 figs., 3 tables, 3 refs., 7 eqs. **DWB, DLC**—The scientific results obtained from rocket and satellite observations have been studied in order to determine the physical properties of the atmosphere at high altitudes. A preliminary model atmosphere is presented for the region between 100 and 800 km. The paper contains numerical tables of density, pressure, and scale height as functions of altitude. Due to solar effects these physical parameters may vary from day to night and from latitude to latitude. However, preliminary studies have indicated that average densities and pressures might vary by at most a factor of two, the variations being larger at high than at medium latitudes. Densities presented by Russian scientists, which were also obtained from rocket and satellite data, agree with the model density presented here reasonably well. The densities derived by American and Russian scientists from satellite observations agree within less than a factor of two. The densities derived from rocket data are lower than the ones derived from satellite data for the same altitude. The maximum difference between the densities derived by MICHNEVICH (1958) from rocket data and the average densities presented here occurs around 150 km, where the values differ by a factor of 3.8; above and below these altitudes the differences are much less. It is estimated that these differences then are within the limits of the variations to be expected and also within the limits of the uncertainties of the experimental data available at present. (*Same item as* 11.4–222, April 1960, *Met. Abstr.*) *Subject Headings:* **1. Atmospheric models 2. Rocket exploration of the upper atmosphere 3. Satellite observational data.**—*Author's abstract.* Ⓢ

11I–160 551.506.7:551.506.22(712.7)

†Kellogg, William W., **Review of IGY upper air results.** *Rand Corporation, Santa Monica, Calif., [Papers]*, P-1717, June 5, **1959.** 21 p. 5 figs., numerous refs. **DLC**—Recent findings concerning conditions in the stratosphere, mesosphere, and ionosphere are discussed in that order. In the lower stratosphere, improved balloon soundings have made it possible to draw constant pressure charts up to the 10 mb level. Rapid-warming processes and the use of ozone and radioactive debris as tracers are briefly discussed. For the higher atmosphere, density and pressure values obtained from rockets and satellites and compiled by KALLMANN (*Rand Paper* 1591, Jan. **1959**) are reproduced to illustrate mean conditions. Diurnal variations in density revealed by NRL rocket observations at Ft. Churchill, and recent data on atmospheric composition from the Univ. of Michigan and NRL are discussed. In the final section, solar-terrestrial relationships are taken up, with special mention of the close correlation of 10 to 20 cm radio emanations from the sun with satellite-observed densities. *Subject Headings:* **1. Upper atmosphere observations 2. International Geophysical Year 1957/1958 3. Rocket data 4. Satellite data 5. Ft. Churchill, Canada.**—*R. S. Quiroz.* Ⓢ

11I–161 551.506.22:551.507.362.

Kellogg, William W. (*Rand Corp., Santa Monica, Calif.*), **IGY rockets and satellites: a report on the Moscow meetings, August 1958.** *Planetary and Space Science*, N. Y., London, 1(1):71–84, Jan. **1959.** 5 refs. **DLC**—This report summarizes the proceedings of the Technical Symposia on Rockets and Satellites. Tremendous strides have been made in the exploration of the upper atmosphere and the space beyond by new vehicles. In the summary, the subject matter rather than the vehicle is the central theme. The summary includes chapters on: 1) atmospheric structure; 2) electromagnetic properties of the ionosphere; 3) cosmic and auroral particles; 4) solar and stellar ultraviolet and X-ray radiation; 5) micrometeorites; 6) biological experiments; 7) rocket and satellite instrumentation and special applications; 8) reviews of rocket programs and 9) satellite programs. *Subject Headings:* **1. IGY research 2. Upper atmosphere 3. Rocket observations 4. Satellite observations.**—*E.K.* Ⓢ

11I–162 551.507.362.1:551.510.537:546.21(712.7)

Kupperian, J. E., Jr.; Byram, E. T. et al. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **Molecular oxygen densities in the mesosphere at Fort Churchill.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(1/2):174–178, Oct. **1959.** 2 figs., 10 refs. **DWB, DLC.** Also in: *IGY 1957/1958, IGY World Data Center A, IGY Report Series*, No. 1:203–207, July **1958.**—The transmission of

solar radiation to ultra-violet photodetectors in a rocket was used to obtain O_2 densities in the mesosphere. Densities between 70 and 86 km were lower by a factor of 1.8 in early spring than in midsummer. A temperature minimum of 186°K was observed at 83 to 85 km in March. Dissociation appeared to begin near 86 km in July and 96 km in March. *Subject Headings:* **1. Molecular density 2. Mesosphere 3. Rocket measurement techniques 4. Ft. Churchill, Canada. I. Friedman, H.**—*Authors' abstract.* Ⓢ

11I–163 551.507.362.1

London, Royal College of Science, **Imperial College of Science and Technology.** Its *Research Report, 1956/1959,* **(1959).** 77 p. 36 figs. Report on Dept. of Meteorology, p. 48–52. **DWB** (507.2 L847re)—Meteorological studies being carried out at the Imperial College include: dynamical meteorology with high-speed computers, wind structure and diffusion by use of rockets, infrared radiation, convection and thermals in clouds, cloud microphysics. These studies are described and illustrated on p. 48–52 of this third Technical Report on fields of science. *Subject Headings:* **1. Meteorological research 2. Rocket research 3. Imperial College of Science and Tech.**—*M.R.* Ⓢ

11I–164 551.501.75:551.507.362.1:546.33

Manring, Edward R.; Bedinger, J. F.; Pettit, H. B. (*all, GRD, AF Camb. Res. Ctr., Mass.*) and Moore, C. B. (*A. D. Little, Inc., Camb., Mass.*), **Some wind determinations in the upper atmosphere using artificially generated sodium clouds.** *Journal of Geophysical Research,* Wash., D. C., 64(6):587–591, June **1959.** 4 figs., table, 5 refs. **DWB, DLC**—Observation of the motion of trails produced by ejecting sodium vapor from rockets has allowed determination of some upper atmospheric winds. Simultaneous three-site photography was used to determine the position of the trail over a period of several minutes. As the result of three rocket flights, twilight wind measurements have been made over the altitude region 77 to 200 km. *Subject Headings:* **1. Upper atmosphere wind analysis 2. Rocket photography 3. Sodium ejection techniques.**—*Authors' abstract.* Ⓢ

11I–165 551.510.5:061.6:551.501.8:551.594.12

†Marmo, F. F.; Aschenbrand, L. M. and Pressman, J. (*all, GRD- AF Cambridge Res. Ctr.*), **Artificial electron clouds. Pt. 1, Summary report on the creation of artificial electron clouds in the upper atmosphere.** *Planetary and Space Science,* N. Y., 1(3):227–237, Aug. **1959.** 3 figs., 4 tables, 3 refs. **Pt. 2, General considerations.** *Ibid.,* 1(4):291–305, Sept. **1959.** 7 figs., 4 tables, 25 refs., 25 eqs. **Pt. 3, Release of atomic potassium at 121 km.** p. 306–318. 6 figs., table, 10 refs., 8 eqs. **Pt. 4,** (by Pressman, J. et al.) **Thermal ionization study, night time cesium release at 101 km.** *Ibid.,* 2(1):17–25, Oct. **1959.** 6 figs., table, 5 refs., 8 eqs. **DWB, DLC**—Pt. 1 is devoted to summarizing the general concepts, methods and techniques and operating procedures employed in the study. It includes tabulated summaries of the various optical-radar detection data in addition to some scientific uses of artificial electron clouds. In Pt. 2, the creation of artificial electron clouds by the ejection of proper contaminants into the upper atmosphere is discussed. General considerations which are common to the several papers to follow are presented. It is concluded that the practical altitude limits of generation of long-lived electron clouds is between about 70 and 200 km. In Pt. 3, the results of the first successful rocket seeding experiment at an altitude of 121 km are analyzed. Under the project a series of eight rocket experiments have been performed. The analysis and interpretation of the data was successfully accomplished by assigning the initial ionization to thermal effects after which solar photoionization of the released contaminant predominates. In Pt. 4, the radio-radar and optical observations of an electron cloud created by the nighttime release of cesium at 101 km is reported. An analysis of the electron yield based upon the thermochemistry and the Saha relationship indicates that the electrons observed can be reasonably ascribed to thermal ionization. *Subject Headings:* **1. Artificial electron clouds 2. Upper atmosphere research 3. Rockets.** —*E.K.* Ⓢ

11I–166 551.501.7:551.507.362

Massey, H. S. W. (*Dept. of Physics, Univ. College, London*), **Scientific applications of rockets and satellites.** (In: Symposium on High Altitude and Satellite Rockets, Cranfield, England, July 1957. [**Proceedings**]. N. Y., Philosophical Library, **1959.** p. 7–14.) **DWB** (629.1388 S989hi)—Some of the more important aspects of high altitude research by way of rocket and satellite-borne instruments are considered here. The topics include: studies of the solar spectrum before reaching the earth's atmosphere, ionospheric refractive index, electron concentration, the positive and negative ions, the dynamo currents responsible for the quiet magnetic variations, the soft x-radiation, airglow, production of ionized and metallic clouds in relation to distribution of winds and temperature as well as the basic properties of the atmosphere. The instrumentation comprises spectrographs with photographic recordings, photoelectric telemetering, photon counters, ion analyzers, magnetometers, photometers, etc. *Subject Headings:* **1. Upper atmosphere research**

methods 2. Upper atmosphere physics 3. Rocket instrumentation 4. Satellite instrumentation. —*W.N.* Ⓢ

11I–167 551.510.53:551.507.362.1

Masterson, John E., **Review of meteorological sounding rockets.** Reprint from *International Symposium on Rockets and Astronautics, First, Tokyo, 1959, Proceedings*, p. 216–223. 8 refs.—In this review the state of the art of meteorological sounding rockets is summarized. The Loki and the Arcas are considered the successors to the Deacon as meteorological sounding rockets. The development of the Loki system has not yet reached the point of perfection; the possibilities and developments of the Arcas rockets designed as such for meteorologists is most encouraging. The experiments of these rockets show the ways in which meteorological conditions can be measured in the higher atmosphere. The author assumes that within a decade meteorological sounding rockets will be used routinely for synoptic stratospheric weather observations. *Subject Headings:* **1. Rocket soundings 2. Upper atmosphere measurements 3. Loki rockets 4. Arcas rockets.**—*E.L.* Ⓢ

11I–168 551.510.5:551.507.362.1

Michigan. Univ. Engineering Research Institute, **Atmospheric phenomena at high altitudes.** Contract DA-36-039-Sc-64659, Quarterly Reports, May 1, 1956–Jan. 31, **1959.** 11 pieces. Paging varies (18 to 61 p. each). numerous figs., tables. **DWB** (M10.5 M624ad)—The purposes of the Contract are: a) to adapt the rocket-grenade experiment for use in the Arctic during the International Geophysical Year; b) to participate in the preparation and firing of the IGY rocket-grenade experiments; c) to collect and analyze upper air samples; and d) to engage in general investigation of problems relating to upper air research. Theoretical studies have been carried out on the subjects of the explosion-produced modulation of DOVAP records, finite amplitude of propagation effects, the effect of variation in velocity of propagation of electromagnetic radiation on the DOVAP system, the possibility of measuring ambient pressure at very high altitudes, and the dynamics of rarified gases. A new system for measuring helium leakage in sampling bottles was devised and used successfully. Two papers on aerodynamic research by V. C. Liu were submitted for publication: **Theory of flight of the sounding rocket** (*J. App. Mech.*) and **On the drag of a sphere at extremely high speeds.** The results and observations of ten rocket-grenade experiments (Fort Churchill, Canada) were summarized. The new program for the Guam DOVAP and ballistic camera tracking system and the instrumentation required were presented. General investigation of the literature has been made in regard to basic topics of interest for future research. Collaboration between Chapman and V. C. Liu was initiated to treat the upper atmosphere separation problem. The quarterly report covering the period Nov. 1, 1958–Jan. 31, 1959 describes: the DOVAP tracking and telemetering and ballistic camera tracking operation carried out on Guam by the U. of Michigan for the U. S. Army Signal Research and Development Laboratory, the IGY Guam rocket programs, the application of LGP-30 computer to the geophysical research investigation. The status of the reduction of the Fort Churchill IGY data is given together with recommendations for completing the work. *Subject Headings:* **1. Upper atmosphere research 2. IGY rocket program 3. Rocket observation techniques. I. Allen, H. F. II. Bartman, F. L. III. Liu, V. C. IV. Otterman, J. V. Wilkie, W. J. VI. Wenzel, E. A.**—*E.K.* Ⓢ

11I–169 551.507.362(02)

†Newell, Homer E., Jr. et al., **Sounding rockets** [by] Homer E. Newell, Jr.; R. B. Cox; E. B. Dorling et al. N. Y., McGraw-Hill, **1959.** 334 p. numerous figs. (incl. photos) and tables, refs. at end of each ch., eqs. (*McGraw-Hill Series in Missile and Space Technology.*) Price: $12.50. **DLC, DWB** (M07.362 N545so). Review by H. S. Bridges in *Review of Scientific Instruments*, N. Y., 30(12):1139–1140, Dec. **1959.** Review by Willis L. Webb in *American Meteorological Society, Bulletin*, 41(2):92, Feb. **1960.**—A well illustrated, high-quality book giving the latest information and data on most of the sounding rockets in use in the U. S., U. K., France and Japan, and including the following: history of rockets; use in geophysical and solar research, in military research; the Aerobee, Aerobee-Hi, Deacon and Cajun, ASP, Loki Wasp, balloon launched rockets, aircraft launched rockets, Nike-Cajun, Nike-Deacon, Terrapin, Viking, British sounding rocket—Skylark, French Veronique and Monica, Japanese Kapa and Sigma, future rockets, facilities for launching and, finally, artificial earth satellites—Vanguard. Russian rockets and satellites are not covered in this book. (*Same item as* 11.1–14, Jan. 1960, *Met. Abstr.*) *Subject Headings:* **1. Sounding rockets 2. Satellite observatories 3. Military rockets. I. Van Allen, J. A. II. Singer, S. F. III. Townsend, J. W. IV. Masterson, J. E.**—*M.R.*

11I–170 551.501.9:621.38:551.507.362

Orville, Howard T., **My crystal ball: ten years ahead in meteorology.** Talk given in San Francisco, Calif., Nov. **19, 1959.** 9 p. Mimeo.—The author gives a glimpse of the future when highly complicated electronic equipment will be used by a national electronics weather network.

These new gadgets include storm detection radar, radar to measure the base and top of the clouds and television arrangement for relaying the pictures of weather conditions. Other new tools include constant level balloons, reconnaissance aircraft, rockets and weather satellites. Other improvements will contribute to the accuracy of forecasts. *Subject Headings:* **1. Meteorological networks 2. Recording equipment 3. Rockets 4. Satellites.**—*A.H.K.* Ⓢ

11I–171 551.524.7:551.557:551.596.1:551.507.362.1

Otterman, Joseph, **Finite-amplitude propagation effect on shock-wave travel times from explosions at high altitudes.** *Acoustical Society of America, Journal,* 31(4):470–474, April **1959.** 3 figs., 7 refs., 24 eqs. **DLC**—A method is described for calculating the effect of the finite-amplitude propagation on the travel times of pressure waves from explosions at high altitudes to the ground. Numerical results are presented for explosions of 2-lb and 4-lb H.E. charges at altitudes ranging from 15 to 95 km. Vertical propagation is assumed in the calculations. This work has been carried out in order to improve the systematic accuracy of the rocket grenade experiment for upper atmosphere temperature and winds. The significance of the finite-amplitude propagation in this experiment is discussed. (*Same item as* 10G–115, July 1959, *Met. Abstr.*) *Subject Headings:* **1. Explosion waves 2. Upper air temperature measurement techniques 3. Upper air wind measurement techniques 4. Rocket grenades.**—*Author's abstract.*

11I–172 551.506.22:551.510.3:551.507.362.1:531.52

Peterson, J. W.; Schulte, H. F. and Schaefer, E. J., **A simplified falling-sphere method for upper-air density, Pt. 2, Density and temperature results from eight flights.** Michigan. University. Research Institute, Contract AF 19(604)-999, Final Technical Report, May **1959.** 30 p. 68 figs., 11 tables, 12 refs. **DWB** (M10.3 M6245).—The development and use of the small-sphere method for synoptic measurement of upper-air density and temperature is described. Density (and hence temperature) are calculated by means of the drag equation applied to a free-falling sphere, which contains an omni-directional accelerometer. The report presents the modifications made in the electronics of the sphere-to-ground-station telemeter system which arose from the decision to use a pulseposition (time) code modulation for telemetering the accelerometer data. Ten flights of the new version of the small sphere experiment were carried out as part of the IGY or pre-IGY program of the U. S. The results from flights are tabulated. *Subject Headings:* **1. IGY research 2. Upper atmosphere observation techniques 3. Rocket soundings 4. Falling sphere method.**—*E.K.* Ⓢ

11I–173 551.507.362:551.510.53:550.3:061.3(47)

Petrov, Boris M. (*U.S.S.R. Academy of Sciences*), **U.S.S.R. rocket and earth satellite programme for the IGY.** (In: Symposium on High Altitude and Satellite Rockets, Cranfield, England, July 1957, [**Proceedings**]. N. Y., Philosophical Library, **1959.** p. 56–57.) **DWB** (629.1388 S989hi)—An account of the program of studies of upper atmosphere phenomena includes: structural parameters of the atmosphere, optical properties, ultra-violet and X-ray solar radiation, corpuscular solar radiation and auroras, cosmic rays, ionospheric phenomena, earth's magnetic field, micrometeors and micrometeorites, physical and chemical processes in the upper layers of the atmosphere. These topics are discussed very briefly. The firings to take place as follows: First zone: The Arctic, Franz Josef Land 80°N lat., 25 firings in 1958. Second Zone: U.S.S.R. 50–60°N lat., 30 firings in 1957 and 40 firings in 1958. Third Zone: The Antarctic, mainly in the area of Mirny, 50–60°S lat., 30 firings in 1957–1958. The firings were to be evenly distributed throughout the IGY, mainly on World Days. *Subject Headings:* **1. Soviet participation in IGY 2. IGY rocket program 3. IGY satellite program 4. Upper atmosphere research 5. U.S.S.R.**—*W.N.* Ⓢ

11I–174 551.506.7:551.507.362.1

Poppoff, I. G., **Rocketsondes for high-altitude soundings.** *Stanford Research Institute, SRI Journal,* 3:56–60, **1959.** figs. **DLC**—Due to the limitations of balloons a new instrument has been developed to penetrate the atmosphere. This rocketsonde system will be able to collect data at an altitude of 150 thousand feet. It will be based on a small single-stage rocket. A new revolutionary tracking system is under development. New techniques are now available for routine measurement of winds and temperature at a height of 200 thousand feet. *Subject Headings:* **1. Upper atmosphere sounding methods 2. Rocket soundings.**—*A.H.K.* Ⓢ

11I–175 551.510.5:551.507.362.1

Izuchenie verkhneĭ atmosfery (uspeshnyĭ pusk odnostupenchatykh geofizicheskikh raket). [Studies of the upper atmosphere: successful launching of the single stage geophysical rockets.] *Priroda,* Moscow, No. 8:84, Aug. **1959. DLC**—The two medium-range single stage geophysical ballistic rockets that were launched on July 2nd and 10th, 1959, carried more than 2000 kg of equipment, 2 dogs and 1 rabbit, which were safely returned to earth. The rockets were equipped with instruments for the study of: the ultraviolet portion of the spectrum, the structure of the ionosphere,

the micrometeoric flow, the direction and speed of air streams at various heights, as well as with implements for determining the density, pressure, temperature and composition of the atmosphere at various heights. A careful analysis of numerous data that were obtained during the flights is being carried out at present. *Subject Headings:* **1. Upper atmosphere physics 2. Soviet rockets 3. Rocket measurements.**—*A.M.P.* Ⓢ

11I–176 551.510.5:551.507.362

†Repnev, A. I., **Svoĭstva verkhneĭ atmosfery i iskusstvennye sputniki zemli.** [Properties of the upper atmosphere and artificial earth satellites.] *Moscow, Tsentral'naia Aerologicheskaia Observatoriia, Trudy*, No. 25:5–62, **1959.** 6 figs., 12 tables, 137 refs., 57 eqs. **DLC**—Described as the first comprehensive Russian-language report on the upper atmosphere based on data from satellites, this survey article actually covers both satellite and rocket research. The author's manuscript went to press in the second half of 1958 and includes observational results from the first six Soviet and American satellites (through 1958-delta launched May 15, 1958); but rocket results are largely those obtained from rockets fired before 1957, although *IGY Rocket Report* No. 1, which covers rockets fired through early 1958, is cited among the literature references. The U.S.S.R. rocket data presented here are principally those published by ALEKSEEV and MIKHNEVICH in 1957. The topics discussed in the section on rocket results include the following: atmospheric temperature, pressure and density, molecular state, the earth's magnetic field, wind and general circulation models, turbulence, molecular diffusion, and photodissociation. The section on satellites begins with a physical description of the satellites launched to May 1958 and a listing of the experiments involved in each launching. This is followed by a brief exposition of the scientific uses of earth satellites, including a list of 19 categories of potentially derivable information, and extended discussions, with observational results obtained thus far, for a number of special topics, including the determination of pressure and density, geodesic measurements, meteors and interplanetary matter, the measurement of the intensity of Lyman alpha radiation, the ionosphere (ion composition, electron density, etc.) the earth's magnetic field, cosmic ray research, the general theory of relativity, and others. *Subject Headings:* **1. Upper atmosphere properties 2. Satellite data 3. Rocket data.**—*R. S. Quiroz.* Ⓢ

11I–177 551.507.362.1:551.576.11:779(73)

Frontal cloud system pictures obtained by rocket. *Science*, Wash., D. C., 129(3343):198–200, Jan. 23, **1959.** photos. **DLC**—A project Hugo Nike-Cajun rocket obtained, on Dec. 5, 1958, excellent photographs of cloud and frontal systems over and off the East Coast of the U. S. (200 900 mi east of Virginia Capes). The rocket was launched from the Nash Station at Wallops Island, Va. The rocket was tracked by ship and aircraft and the nose cone instrument package located and removed from the sea by the destroyer USS "Leary" in 8–10 ft swells and 25–40 knot winds. Details of the rocket launching, the instrumentation, etc. are given and the general HUGO (Highly Unusual Geophysical Operations) program are outlined, and the cloud panorama and synoptic chart shown in illustrations. Plans call for 8–10 similar shots in 1959. Missiles cost $7000 each. *Subject Headings:* **1. Rocket cloud system photographs 2. Nike-Cajun rockets 3. Project Hugo 4. U. S. East Coast.** —*M.R.* Ⓢ

11I–178 551.510.53:551.501.71

Shklovskiĭ, I. S. and Kurt, V. G., **Opredelenie plotnosti atmosfery na vysote 430 km metodom diffuzii parov natriia.** [The determination of the density of the atmosphere at an altitude of 430 kilometers by the sodium vapor diffusion method.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 3:66–76, **1959.** 7 figs., 16 refs., 19 eqs. **DLC, DWB.** Summary in *U. S. National Aeronautics and Space Administration, Technical Translations*, F-8:6–7, April **1960.** Complete transl., *Ibid.*, F-15, April **1960.** 13 p.—A method is described for the determination of atmospheric density from observation of the diffusion of sodium vapors over a large range of altitudes. The lower limit of this range can apparently be taken at around 200 km. The upper limiting region where the method is applicable is apparently between 500 and 600 km. *Subject Headings:* **1. Upper atmosphere density measurement techniques 2. Sodium ejection technique.**—*Authors' abstract.* Ⓢ

11I–179 551.507.362.1

Stephens, W. H. (*Royal Aircraft Establishment*), **British upper atmosphere sounding rocket.** (*In*: Symposium on High Altitude and Satellite Rockets, Cranfield, England, July 1957, [**Proceedings**]. N. Y., Philosophical Library, **1959.** p. 23–28. 10 figs., 2 tables.) **DWB** (629.1388 S989hi) —This is an illustrated description of the British "Skylark" rocket as designed by the Royal Aircraft Establishment for use in the series of experiments planned by the Gassiot Committee of the Royal Society. Included are graphical representations of the Skylark's predicted flight data, predicted trajectory, and its maximum height in relation to payload, etc. Some changes in design in order to increase the altitude performance are also discussed. *Subject Headings:* **1. Sounding rockets 2. Skylark rocket 3. Upper atmosphere research.**—*W.N.* Ⓢ

11I–180 551.507.362.1:551.511

Stroud, W. G.; Nordberg, W. and Bandeen, W. R. (*all, U. S. Army Sig. R & D Lab., Ft. Monmouth, N. J.*), **Rocket-grenade observation of atmospheric heating in the Arctic.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1342–1343, Sept. **1959.** fig., 3 refs. **DLC**—Ten Aerobee Rockets were fired to altitudes up to 100 km. The plotted data shows an average lapse rate of −1°C per km. Extremely low temperatures were measured at 80 km during the summer months. These are in contrast to the relatively high temperatures observed during the winter months. Explosive warmings result from the wintertime "breakdown of essentially zonal flow into large-scale meridional flow." The entire atmosphere up to 75 km becomes involved in this change in the flow pattern. *Subject Headings:* **1. Atmospheric thermodynamics 2. Arctic research 3. Aerobee rockets firings. I. Bartman, F. L. II. Titus, P.**—*E.Z.S.* Ⓢ

11I–181 551.507.362:550.3

Stuhlinger, Ernst, **Raketen und Satelliten im Dienste der Geophysik.** [Rockets and satellites in service of geophysics.] *Die Naturwissenschaften*, Berlin, 46(9):303–309, May **1959.** 11 figs. **DLC**—A historical review is given of the evolution of geophysical research by means of rockets and artificial satellites in the U. S. Work is mentioned of Van Allen, Millikan, Kaplan, Pickering, Zwicky, Whipple, von Kármán and Gramov. Numerous technical data are presented and many results are given obtained by Corporal, Nike, Aerobee, Redstone, Thor and Jupiter rockets. *Subject Headings:* **1. Rockets and satellites 2. Utilization in geophysical researches.**—*A.V.* Ⓢ

11I–182 551.507.362.1:523.77

Violett, T. and Rense, William A. (*both, Physics Dept., Univ. Colorado*), **Solar emission lines in the extreme ultraviolet.** *Astrophysical Journal*, Chicago, 130(3):954–960, Nov. **1959.** table, 5 refs. **DWB, DLC**—Measurements of rocket spectrograms obtained from Aerobee-Hi flights on June 4, 1958, and March 30, 1959, have yielded wave lengths of about 150 solar ultraviolet emission lines in the range between 1216 (*HLα*) and 83.9 A. Estimates of the intensity of the He II 303.8 A line were made. Measured wave lengths corrected for systematic errors and, in some cases, identifications of the lines are given. *Subject Headings:* **1. Ultraviolet radiation intensities 2. Rocket spectrograph observations.**—*Authors' abstract.* Ⓢ

11I–183 551.501.7:551.507.362.1:778.34

Voigt, H. H., **UV-Spektrum der Sonne und Bild der Sonne in Lyman-Alpha.** [Solar UV-spectrum and image of the sun in Lyman-Alpha radiation.] *Die Sterne*, Leipzig, 35(11/12):246–247, Nov./Dec. **1959.** fig., ref. **DLC**—The U. S. Naval Research Observatory succeeded in taking photos of the sun in *Lα*-radiation, outside the atmosphere. Culminating point of the rocket was 123 mi. Short description of the optical device. Among the 60 photos taken, the best were those with the shortest exposure. Photos were taken at the same time from the ground (for the photos, see: Sky and Telescope, 8, 440, June 1959). Comparison of the image in *Lα*-, *Hα*-, Ca- and outradiation. *Subject Headings:* **1. Solar spectrum 2. Solar photography 3. Earth photography from outer atmosphere 4. Lyman Alpha radiation 5. Rocket photography.**—*A.V.* Ⓢ

11I–184 551.507.362.1

Webb, Willis L. and Jenkins, Kenneth R. (*both, White Sands Missile Range, New Mexico*), **Application of meteorological rocket systems.** *Journal of Geophysical Research*, Wash., D. C., 64(11):1855–1861, Nov. **1959.** 10 figs., 13 refs. **DLC**—A series of test rocket firings has been conducted during the past 18 months to establish the operational feasibility of numerous rocket systems for meteorological observations. As might be expected, the most desirable systems from the point of view of instrumentation are generally not the most desirable from that of the rocket-firing problem. It has been demonstrated, however, that a reasonable observation schedule can be accomplished by the judicious application of currently available rockets and sensors. The most variable of high atmosphere meteorological parameters is the flow. Chaff was used initially for rocket wind measurements because it could be expected to provide a suitable indication of the wind in the atmosphere above balloon sounding levels. It is easy to package and deploy. Most of the available high atmosphere wind data have been obtained through use of a chaff sensor, and it is still most applicable for point measurements and at very high altitudes. The need for a more coherent sensor and a vehicle capable of transporting a telemetry system to provide for the measurement of other parameters has resulted in the development of a parachute system. Although an altitude range problem will always be encountered, it is possible to obtain data from approximately 200,000 ft to the surface through the application of a single parachute and balloon combination. Launch and flight characteristics of the tested rockets are presented for use in applying this new observational technique. Careful adherence to the design and operational restrictions indicated by these data will result in savings in the effort required for development of the various desirable measuring techniques. Experience to date indicates that it is possible, with available equipment and a reasonable expenditure

of effort, to obtain profiles of several meteorological parameters from the surface to altitudes of the order of 200,000 ft. (*Same item as* 11-5-177, May 1960, *Met. Abstr.*) *Subject Heading:* **1. Rocket exploration of the upper atmosphere.**—*Authors' abstract.* Ⓢ

1960

11I-185 551.507.362:551.521.17

Athay, R. Grant (*High Alt. Obs., Univ. of Colo., Boulder, Colo.*), **Rocket and satellite observations of the solar ultra-violet spectrum.** *Nature*, London, 186(4730):1036, June 25, **1960.** ref., eq. **DWB**—Analyzing the solar atmosphere and the energy sources of the terrestrial ionosphere, interest has centered mainly around the Lyman-α lines because of their greater strength. Referring to rocket and satellite programs under way, the purpose of this communication is to direct attention to the importance of parallel observations of the Lyman-β lines. Data for the Lyman-lines offer strong supplement to Lyman-α data and the analysis of one line will be greatly facilitated if data for the other line are available. *Subject Headings:* **1. Lyman beta radiation measurements 2. Rocket spectroscopy 3. Satellite spectroscopy.**—*E.K.* Ⓢ

11I-186 551.507.362.1:551.524.7:551.596.1

Bandeen, William R. and Otterman, Joseph, **Temperature correction in the rocket-grenade experiment due to the finite-amplitude-propagation effect.** *Journal of Geophysical Research*, Wash., D. C., 65(3):851-855, March **1960.** 2 figs., 2 tables, 6 refs., 26 eqs. **DLC**—A method of applying finite-amplitude-propagation corrections to the temperature values derived from velocity of sound measurements in the rocket-grenade experiment is described. Although small, these corrections are not negligible, being of the same order of magnitude as the probable error in the temperature determination from all other causes. The method is applied to one temperature profile derived in a past rocket-grenade experiment. *Subject Headings:* **1. Rocket data 2. Upper air temperatures 3. Propagation of sound.**—*Authors' abstract.*

11I-187 551.507.362.1

Brown, John A. (*Ballistics Res. Lab., Aberdeen, Md.*), **Arcas high-altitude meteorological rocketsonde system.** *New York Academy of Sciences, Transactions*, Ser. 2, 22(4):275-283, Feb. **1960.** 6 figs., table, 8 refs. **DLC**—The Arcas rocket shown in figure 1 (all-purpose rocket for collection of atmospheric soundings) originally was developed under the sponsorship of the three services as represented by the Office of Naval Research, Air Force Cambridge Research Center, and the United States Army Signal Research and Development Laboratories. The Arcas sounding rocket was developed for the stratospheric meteorologist and high-altitude research scientist as a low-cost integrated system to obtain routine temperature and pressure and wind measurements, and to conduct experiments between 80,000 and 250,000 ft. *Subject Headings:* **1. Upper atmosphere research 2. Rocket soundings 3. Arcas rockets.**—*Author's abstract.* Ⓢ

11I-188 551.507.362.1:551.510.53

Faust, Heinrich (*Offenbach a.M.*), **Raketenmeteorologie.** [Rocket meteorology.] *Naturwissenschaftliche Rundschau*, Stuttgart, 13(3):95-99, March **1960.** 5 figs., 9 refs., eq. **DWB, DLC**—Possible contributions of meteorologists to astronautics include the estimation of meteorological parameters such as wind and air density, and the evaluations of their statistical characteristics. Astronauts, on the other hand, can contribute to meteorology by the exploration of altitudes above 20 km by research rockets investigating vertical movements above the zero layer of absolute calm. It would be of advantage to launch such rockets daily for a few weeks in each season up to 100 km, then to distribute the same amount of rockets in equal intervals of a year and to make their results available to meteorologist. The cooperation of astronauts and meteorologists is demonstrated on the problems of "rendezvous in the universe," of Venus sounding rockets which would involve the application of the knowledge on earth's atmosphere to the atmospheres of other planets. Empirical data recorded by rockets would give a firmer basis to the hypothetical speculations of meteorologists. The problems involved are illustrated by diagrams of wind profiles, vertical circulation, mean deviation of density in full-developed highs and lows, and of wind measurements by rockets. *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Rocket soundings 3. Venus rockets.**—*O.T.* Ⓢ

11I-189 551.510.3:551.507.362.1:531.52

Haycock, Obed C., **Improvements in the falling sphere instrumentation.** Utah. Univ. Upper Air Research Laboratories, Contract AF 19(604)-4956, Final Report, Feb. 10, **1960.** 17 p. 10 figs. (incl. photo), 3 refs. **DWB**—This report covers investigations to improve the circuitry and performance of the falling sphere experiment. A study has been made of the operation of the sphere and conversion from mechanical timing and electronic tubes to solid state devices insofar as the state

of the art will permit. The results of a study of the antenna operation at 400 and at 730 mc are also included. The falling sphere experiment has been developed for measuring gas densities of the atmosphere by the use of sounding rockets. *Subject Headings:* **1. Upper atmosphere density measurement techniques 2. Falling sphere method.**—*Author's abstract.* Ⓢ

11I–190 551.506.22

†*International Geophysical Year, 1957/1958. IGY World Data Center A, National Academy of Sciences, Wash., D. C., **Fifth six-monthly catalogue of data in IGY World Data Center A.** Its *IGY General Report* No. 8, Feb. **1960.** 206 p. Includes references to published sources of data, and other pertinent literature. Data divided into 11 disciplines: Airglow and Ionosphere; Aurora (Instrumental); Aurora (Visual); Cosmic Rays; Geomagnetism, Gravity and Seismology; Glaciology; Longitude and Latitude; Meteorology and Nuclear Radiation; Oceanography; Rockets and Satellites; and Solar Activity. **DWB** (500.82 1611fi)—The volume contains a table showing the location of 16 IGY World Data centers in the U. S. and a catalogue of data received at these centers in the various disciplines listed above during the period July 1, 1957–Dec. 31, 1959. *Subject Headings:* **1. IGY data catalogues 2. IGY World Data Center A.**—*M. R.* Ⓢ

11I–191 551.509.3:551.507.362.1(794)

Masterson, John E.; Hubert, William E. and Carr, Thomas R., **Temperature and wind data measured by meteorological rockets at Point Mugu, California.** Abstract of paper presented at International Symposium on Rockets and Astronautics, 2nd Tokyo, Japan, May **1960.** Orig. Unchecked.—Meteorologists are on the threshold of obtaining, on a synoptic seasonal basis, wind and temperature data at altitudes between 30 and 60 kilometers. The launching of meteorological rockets from a number of stations are providing, for the first time, synoptic data from the mesosphere (20 to 60 km). Information concerning the firing of the LOKI and ARCAS meteorological rockets from one of these stations, Point Mugu, California, is presented. The techniques of handling and launching are discussed. Wind data from radar trackings of chaff and parachutes are presented. The data from parachute borne temperature sensors as telemetered with standard meteorological receiving equipment are also discussed. *Subject Headings:* **1. Synoptic data 2. Mesosphere 3. Rocket soundings 4. LOKI rockets 5. Arcas rockets 5. Point Mugu, Cal.**—*Author's abstract.* Ⓢ

11I–192 551.596.1:551.507.362.1

Michigan Univ. Engineering Institute. **Atmospheric phenomena at high altitudes.** Contract DA 36-039-Sc-64659, Final Report. April 14, 1955–January 31, 1960. Pub. April **1960.** 7 p. 30 refs. **DWB** (M10.5 M624ad). A general survey of the contract requirements concerning upper air wind and temperature measurements with rocket-grenades in the Arctic regions at altitudes between 30 and 90 km. The report includes the various supplementary tasks which were added to the contract from time to time. The reports which describe in detail each major task are also listed. *Subject Headings:* **1. Rocket-grenade wind determination 2. Rocket-grenade temperature determination 3. Upper atmosphere research. I. Bartman, F. L. II. Jones, L. M. III. Contract DA 36-039-Sc-64659.**—*E. K.* Ⓢ

11I–193 551.510.3:531.52:551.524.7

Peterson, J. W.; Robinson, D. A. and Schulte, H. F., **Falling-sphere instrumentation development.** Michigan. University. Research Institute, Contract AF 19(604)-2415, Final Report, Feb. **1960.** 45 p. 27 figs. (incl. photos), plus 12 figs. in appendix, 3 tables, 20 refs., numerous eqs. and several tables. **DWB**—Work on the continuing development of the falling-sphere technique for measuring upper-air density and temperature is described. The factors limiting the performance of the transit-time accelerometer were investigated, and a design concept was reached which, it is anticipated, will improve the performance. The data-reduction process for the sphere experiment was completely computerized and is reported. An investigation of the phenomenon of antenna breakdown in flight is described. *Subject Headings:* **1. Upper atmosphere density 2. Upper air temperatures 3. Falling sphere instrumentation.**—*Authors' abstract.* Ⓢ

11I–194 551.501.7:551.551:551.507.362.1(712.7)

Poetzschke, Heinz (*Aberdeen Proving Ground, Maryland*), **Wind determination from an Aerobee firing.** *Journal of Geophysical Research*, Wash., D. C., 65(1):368–369, Jan. **1960.** 2 tables, eq. **DWB, DLC**—The article summarizes the observations obtained on Aug. 19, 1957, at Fort Churchill, Canada, where an Aerobee rocket was fired to determine wind velocities. The positions of the grenade bursts were recorded by a photogrammetric camera system. The evaluation of this experiment is presented in the attached tables. *Subject Headings:* **1. Upper atmosphere wind measurements 2. Rocket soundings 3. Aerobee observations 4. Ft. Churchill, Canada.**—*E. K.* Ⓢ

11I–195 551.521.12:551.508.953:551.507.362.1

Purcell, J. D. and Tousey, R. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **The profile of solar hydrogen-Lyman-α.** *Journal of Geophysical Research*, Wash., D. C., 65(1):370–372, Jan. **1960.** fig., 6 refs. **DWB, DLC**—In connection with the IGY as a part of the U. S. effort, an Aerobee-Hi rocket was fired on July 21, 1959, to determine the profile of the Lyman-α line of hydrogen in the solar radiation. Out of ten exposures, nine were successful. An exposure of 30 sec. duration, made at 134–163 km altitude is reproduced along with a microphotometer tracing. The different exposures show that the profiles of Lyman α from plage regions, areas with no plage activity, and regions near the limb are not exactly alike. The measurements with an ion chamber show the Lyman α emission from the entire sun to be 6 erg/cm² sec. *Subject Headings:* **1. Lyman alpha radiation 2. Rocket spectrograph observations.**—*E.K.* Ⓢ

11I–196 551.501.75:551.557:551.507.362.1(793)

Smith, Lawrence B. (*Sandia Corp., New Mexico*), **The measurement of winds between 100,000 and 300,000 ft. by use of chaff rockets.** *Journal of Meteorology*, Boston, 17(3):296–310, June **1960.** 16 figs., 3 tables, 26 refs., 5 eqs. **DWB, DLC**—During July and Aug., 1958, a total of 20 wind observations was made at altitudes between 100,000 and 300,000 ft at Johnston Island in the Pacific Ocean. In addition, three observations were made at Tonopah, Nevada in May 1958. These measurements resulted from radar tracking of chaff expelled from rockets. A bright profile of the measured winds is presented, and a description of the two-stage rocket-delivery system is given. Observed winds were predominantly and consistently easterlies with average speeds near 75 km. Little change with altitude was noted, although there are indications of reversal of direction to westerlies above 300,000 ft. System errors are discussed. Also, an attempt is made to determine 12- and 24-hourly periodicities in these data; results are inconclusive, however, because of data scarcity. *Subject Headings:* **1. Upper air winds 2. Rocket experiments 3. Johnston Island 4. Tonopah, Nev.**—*Author's abstract.* Ⓢ

11I–197 551.510.53:551.507.362.1

Sutton, Sir Oliver Graham, **High atmosphere research in the Meteorological Office.** *Meteorological Magazine*, London, 89(1053):97–98, April **1960. DWB, DLC**—During the last few years, due to the development of rockets, upper limit of altitude of atmospheric research has risen. More and more attention has been paid to rockets. The decision to regard 100 kilometers as the top of meteorologists' atmosphere, does not mean that it is the limit of meteorology. In mid-latitudes there is little change in mean temperature from the tropopause to about 20 kilometers but temperature increases to a maximum of about 20°C at 50 km. Efforts are being made to study earth's atmosphere up to 100 km. The rockets will play an important role in this research. *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Temperature variations.**—*A.H.K.* Ⓢ

11I–198 551.507.362.1:551.506.7

†Stroud, W. G.; Nordberg, W.; Bendeen, W. R. et al., **Rocket grenade measurements of temperatures and winds in the mesosphere over Churchill, Canada.** Also issued in: *Journal of Geophysical Research*, Wash., D. C., 65(8):2307–2323, Aug. **1960.** 14 figs., table, 23 refs., 7 eqs. **DLC.** Condensed version in: *IGY Bulletin*, Number 40:1–6, October **1960.** 3 figs. *Institute of the Aeronautical Sciences, N. Y., IAS Paper*, No. 60-47, **1960.** 30 p. 14 figs., table, 22 refs. **DWB** (M:629.13 I59pa)—The firing of ten Aerobee rockets, each carrying 18 to 19 high-explosive grenades at Ft. Churchill, Canada, resulted in the accurate measurement of temperatures and winds in the atmosphere up to 95 km, during November, 1956, July, August, and December, 1957, and January, 1958. The total number of temp. and wind measurements is 150 for each of the two parameters over the period. Each measurement represents an average temperature and wind of an atmospheric layer of about 3 km thickness. The results show clearly a seasonal variation with average summer temperatures of 275°K and 170°K at altitudes of about 50 and 80 km respectively; corresponding average winter temperatures are 260°K and 230°K. In summer prevailing winds were from the east, usually less than 50 m per sec. In winter these winds were from the west, usually between 50 and 100 m per sec, but in many instances exceeding 100 m per sec. A breakdown in circulation up to 80 km is indicated by the results of two firings on Jan. 27, 1958 where strong northerly-southerly wind components were measured. This phenomenon coincides with the occurrence of sharp temperature increases at stratosphere levels over large parts of the northern hemisphere east of Churchill. Remarkable temp. inversions between 50 and 80 km were measured in all winter firings. These inversions resulted in second temp. peaks above 50 km. On Dec. 11, 1957, the temp. at 70 km was about 270°K. In summer, temperatures at 50 km and below at Churchill (59°N) were higher than at White Sands (33°N); above 60 km the Churchill temps were lower. This picture is exactly reversed in winter. Only minor diurnal temp. variations were detected. The experiments also indicated that no sound energy from detonations of 4-pound high explosive charges above 95 km can be detected on the ground with microphones of 1-dyne-per-square-centimeter sensitivity in the

frequency range 8-to-25 cycles per second. *Subject Headings:* **1. Rocket grenade experiments 2. Mesospheric temperatures 3. Mesospheric winds 4. Ft. Churchill, Canada. I. Bartman, F. L. II. Titus, P.**—*Authors' abstract.* Ⓢ

SUPPLEMENTARY MATERIAL

11I-199 551.501.7:551.510.5:551.507.362.1

Atlantic Research Corporation, Alexandria, Va., **Arcas rocketsonde system: high altitude and meteorological sounding rocket.** (1960.) 8 p. figs.—Parts and performances of the Arcas Rocketsonde System are presented. The system is designed to obtain measurements and conduct experiments from 80,000 to 300,000 ft including atmospheric temperature, pressure, density, water vapor, wind shear, and turbulence, chemical, ionic, electronic atmospheric composition; high altitude photography and television, earth mapping, cloud cover, weather front, nuclear blast damage; RF, radar, infrared, UV, propagation studies; nuclear, solar and cosmic radiation measurements; earth's magnetic field studies, high altitude synoptic data; special high altitude experiments and release of chemical reagents; finally preflight data for missile firings. Its parts—with their performances described and illustrated include a portable launcher, a sounding rocket, a nose-cone separation device, a parachute payload-recovery system, and a telemetry transmitter. *Subject Headings:* **1. Upper atmosphere sounding methods 2. Upper atmosphere research 3. Arcas rockets.**—*O.T.* Ⓢ

11I-200 551.510.535/6:551.507.362.1

Horowitz, R. and LaGow, H. E. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **Summer-day auroral-zone atmospheric-structure measurements from 100 to 210 kilometers.** *Journal of Geophysical Research*, Wash., D. C., 63(4, Pt. 1):757–773, Dec. **1958.** 11 figs., 11 refs., 8 eqs. **DWB, DLC**—The density and pressure of the atmosphere from 100 to 210 km above Fort Churchill, Manitoba, Canada, were determined from the IGY NN3.13F Aerobee-Hi rocket flight on July 29, 1957, at 4:00 p.m., CST. Two magnetic cold-cathode ionization gages were used to measure pressure and pressure changes on the side of the rolling rocket. Excellent agreement was obtained (a) between both gages throughout flight, and (b) between ascent and descent measurements. Measured pressures in the region from 100 to 120 kilometers were corrected for a residual gas pressure of approximately 2×10^{-5} mm Hg. An ambient pressure of 10^{-4} mm Hg was obtained at 107 km. The derived pressure of 4×10^{-6} mm Hg at 210 km is an order of magnitude greater than the corresponding 1951 values measured at the White Sands Proving Ground, N. Mex. Densities were measured from 125 to 210 km. The density value of 6×10^{-7} gm/m^3 at 210 kilometers is five times greater than the 1951 measurement, while at 140 km the difference is a factor of two. Scale heights (RT/Mg) were derived from the measured pressure and density data vs altitude, using the hydrostatic equation. The scale-height value obtained at 210 kilometers was 95 kilometers, and the scale-height gradient from 190 to 210 kilometers was 0.1 km/km. *Subject Headings:* **1. Upper atmosphere structure 2. Aerobee-Hi rockets.**—*Authors' abstract.*

11I-201 551.507.362.1:551.510.53

Mirtov, B. A., **Raketnye issledovaniia sostava atmosfery na bol'shikh vysotakh.** [Rocket investigation of atmospheric composition at high altitudes.] *Uspekhi Fizicheskikh Nauk*, Moscow, 63(1b):181–196, Sept. **1957.** 8 figs., 2 tables, 16 refs. **DLC**—The six main problems involved in upper atmosphere composition studies (pressure measurement, temperature measurement, nature of ionizing particles, the gravitational distribution of gases, dissipation of an atmosphere into world space, corpuscular emission from the sun) are discussed, together with methods of investigating experimentally. *Subject Headings:* **1. Upper atmosphere composition 2. Rocket observations.**—*Physics Abstract* 4558, 1958.

PART III. RECENT MONOGRAPHS AND ANALYTICS FROM SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted. The item number is mentioned for those titles which have been abstracted in previous issues of **Meteorological and Geoastrophysical Abstracts.**

A. RECENT MONOGRAPHS

Baker, Robert H.: **Astronomy: a textbook for university and college students.** 7th ed. Princeton N. J., Van Nostrand, 1959. 547 p. Price 52 sh. 6d. Review by D. H. P. Jones in *Nature*, 186(4718), Suppl. p. 69, April 2, 1960.

Conference on Photoperiodism, Gatlinburg, Tenn., Oct. 29–Nov. 2, 1957: **Photoperiodism and related phenomena in plants and animals.** Ed. by Robert B. Withrow et al. *American Association for the Advancement of Science, Wash., D. C., Publication*, No. 55, 1959. 903 p. numerous figs., tables. Bibliog. at end of each ch. Price 133 sh. DLC (QH651.C6) Review by L. J. Audus in *Nature*, London, 187(4732):96–97, July 9, 1960.

Cox, A. E. and Large, E. C.: **Potato blight epidemics throughout the world.** *U. S. Dept. of Agriculture, Agricultural Handbook*, No. 174, 1960. 230 p. diagrs., tables. Review by P. M. A. Bourke in *World Meteorological Organization, WMO Bulletin*, 9(3):183, July 1960.

Haalck, H.: **Physik des Erdinnern.** [Physics of the earth's interior.] 2d. enl. ed. Akademische Verlagsgesellschaft Geest & Portig K.-G., 1959. 310 p. figs., tables. Price DM 29,—. Review by K. Jung in *Beiträge zur Geophysik, Leipzig*, 69(1):62–63, 1960.

King-Hele, Desmond: **Satellites and scientific research.** London, Routledge and Kegan Paul, 1960. 180 p. Price 21 sh. Review by H. Spencer Jones in *Nature*, 187(4734), p. 268–269, July 23, 1960.

Mitchell, John Murray, Jr.: **Measurement of secular temperature change in the Eastern United States.** June 1960. Thesis (Ph.D.)—Pennsylvania State Univ., Dept. of Meteorology. 154 p. figs., tables, refs., numerous eqs. Vita, p. 154. DWB (M24.34 M681me)

Needham, Joseph and Ling, Wang: **Science and civilization in China.** Cambridge, University Press, 1954–1959. 3 vol. Vol. 1, 1954 (318 p.). Vol. 2, 1956 (696 p.). Vol. 3, 1959 (874 p.). numerous figs., plates, refs. throughout. DLC (DS721.N39)

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